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Paul E. Pughner

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LEMON RESERVOIR

Florida River, Colorado

REPORT ON RESERVOIR REGULATION FOR FLOOD CONTROL

JULY 1974

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

20081029144

LEMON DAM AND RESERVOIR FLORIDA RIVER, COLORADO PERTINENT DATA

GENERAL

Drainage Area (sq mi)	
Florida River at dam site	67.6
Flows at Dam Site	
Average annual runoff (ac-ft) (1928-56)	64,340
Maximum annual runoff (ac-ft) (1941)	143,870
Minimum annual runoff (ac-ft) (1934)	25,170
Spillway design flood peak inflow (cfs)	13,300
Spillway design flood 2-day volume (ac-ft)	26,800

DAM (zoned earth and rockfill)

Maximum height above streambed (ft	215
Crest elevation (ft msl)	8,167
Crest length (ft)	1,360
Crest width (ft)	30
Freeboard above spillway design flood pool (ft) .	6
Total embankment volume (c.y.)	3,042,000

SPILLWAY

(Uncontrolled ogee crest and open chute)

Location	Right abutment
Crest length (ft)	56
Crest elevation (ft msl)	8,148
Channel length (ft)	930
Channel width (ft)	28-52
Discharge capacity (cfs)	9,600
at elevation (ft msl)	8,161

RESERVOIR

Elevation (ft msl)	
Minimum pool	8,023
Joint use pool (bottom)	8,023
Normal full pool	8,148
Spillway design flood pool	8,161
Area (acres)	
Minimum pool	62
Joint use pool (bottom)	62
Normal full pool	622
Spillway design flood pool	686
Storage capacity (ac-ft)	
Minimum pool	1,100
Joint use pool (bottom)	1,100
Normal full pool	40,100
Spillway design flood pool	48,700

OUTLET WORKS

Location	Right abutment
Intake Structure	
Type	Concrete tower
Top elevation (ft msl)	8018
Sill elevation (ft msl)	8005
Conduit (intake tower to gates)	
Type	Concrete lined pressure tunnel
Length (ft)	900
Inside diameter (ft)	8.5
Emergency Gates	
Type	High pressure vertical lift
Number and size	2-2' 3" x 2' 3"
Control Gates	
Type	High pressure vertical lift
Number and size	2-2' 3" x 2' 3"
Bypass Gates	
Type	High pressure gate valves
Number and size	2-8" dia.
Conduit (bypass in gate chamber)	
Type	Steel pipe
Inside diameter (inches)	8
Discharge capacity (cfs)	20
Conduit (gates to stilling basin)	
Type	Modified horseshoe tunnel, free flow
Length (ft)	763
Size Arch (ft)	9
Discharge capacity (cfs)	910
at elevation (ft msl)	8148

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· BUREAU OF RECLAMATION
P.O. BOX 640
DURANGO, COLORADO 81301

Winter Tough on Local Water Storage Structures

The high moisture content of the soil coupled with freezing action has caused damage to the spillway walls at Vallecito and Lemon Dams. In both instances moisture laden earth behind the concrete walls of the spillways has frozen and expanded thereby pushing sections of the walls in.

Vallecito received damage at the stilling basin, the portion of the spillway just before the waters enter the Pine River. Repairs will be completed this summer by the Pine River Irrigation District with engineering assistance by the Bureau. Normal water deliveries will be possible while the repairs are being made.

The damage at Lemon Dam occurred at the opposite end of the spillway. Part of the entrance walls to the spillway succumbed to the freezing action. Movement in the wall had been detected earlier and improved designs were already being prepared at the Bureau of Reclamation's Engineering and Research Center in Denver. The Bureau anticipates making the necessary repairs under a construction contract this summer. Reservoir Superintendent Sam Wall will hold the reservoir surface well below the spillway until the major part of the snowpack has melted. There should be no restriction in water service.

Mud slides are causing problems on yet another Bureau project. The concrete bench flume that delivers water from the Mancos River to Jackson Gulch Dam has been blocked and in one section damaged by large mudslides. The Mancos Water Conservancy District is accomplishing emergency repairs through a local contractor and, barring further slides, the inlet canal will be in operation by early June.

Durango Herald
KIUP
KDGO
Cortez Sentinel

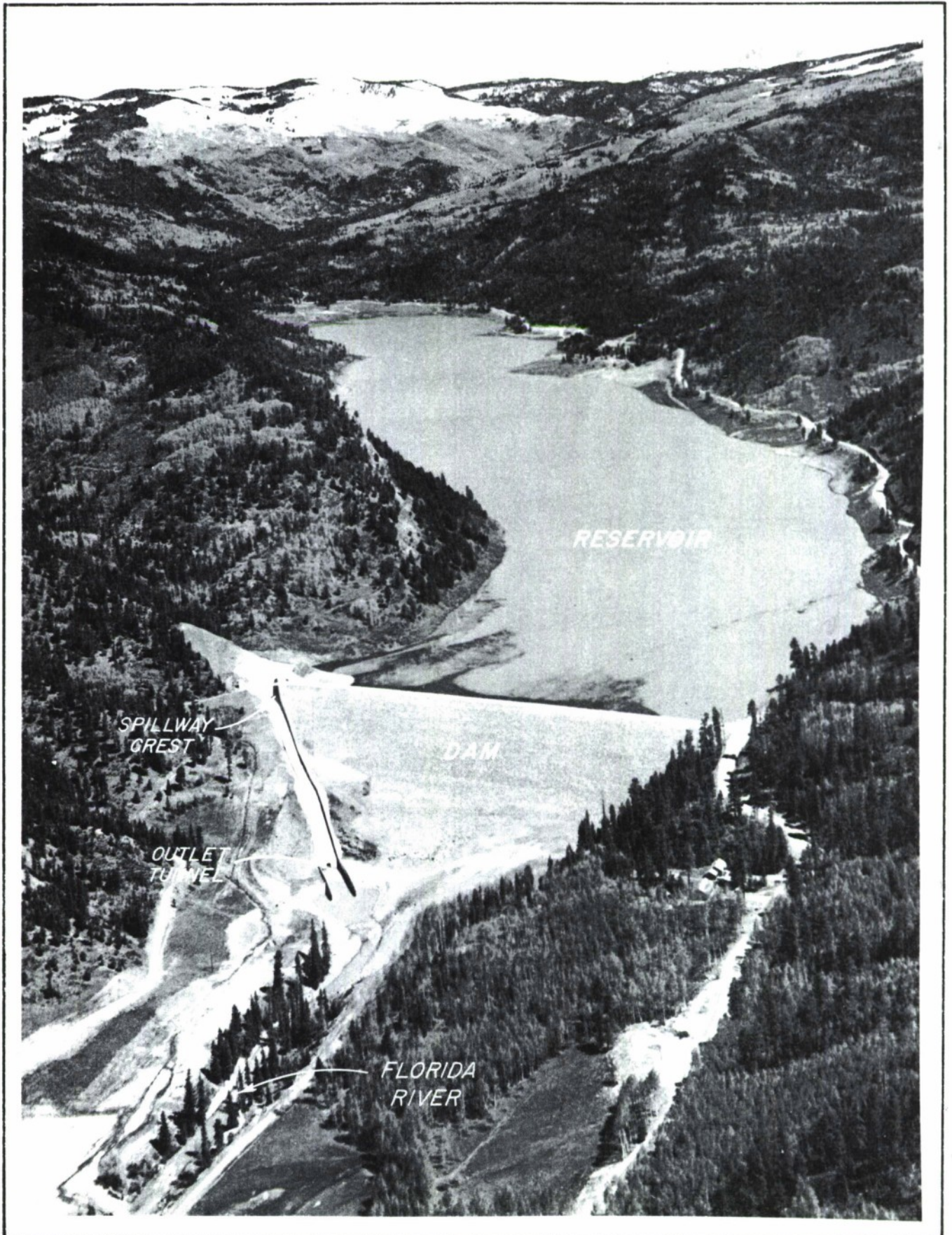


Photo by U.S. Bureau of Reclamation

LEMON DAM and RESERVOIR

PERSONNEL CONCERNED IN FLOOD-CONTROL OPERATION OF LEMON DAM AND RESERVOIR

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	DIVISION OF RIVER CONTROL	801-524-5438 (Salt Lake City,Utah)	L. E. HOLMES CHIEF	801-355-9500 (Salt Lake City,Utah)
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LEMON DAM	PROJECT MANAGER	303-247-0247 (Durango, Col.)	ED K. WISCOMBE	303-247-5332 (Durango, Col.)
	SUPERINTENDENT	303-247-5332 (Durango, Col.)	SAM G. WALL	
DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	DISTRICT ENGINEER	916-449-2232*	COL. F. G. ROCKWELL, JR. DISTRICT ENGINEER	916-483-2010
	RESERVOIR REGULATION SECTION	916-449-2378* 916-449-3168* 916-449-3167*	R. P. LEATHAM CHIEF	
	HYDROLOGY SECTION	916-449-2517*	R. A. NEAL CHIEF	916-791-0478

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*NOTE: BETWEEN 4:30 PM AND 7:45 AM; OR ON SATURDAY, SUNDAY, OR HOLIDAYS
USE 916-452-1535 (FLOOD SEASON ONLY)

LEMON DAM AND RESERVOIR, FLORIDA RIVER, COLORADO

C.D.M.

REV. NOV 1973

REPORT ON RESERVOIR REGULATION
FOR FLOOD CONTROL

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

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FLOOD CONTROL REGULATIONS FOR LEMON DAM AND RESERVOIR

REPORT ON RESERVOIR REGULATION
FOR FLOOD CONTROL

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

CHAPTER I - GENERAL INFORMATION

1. AUTHORITY AND SCOPE

a. This report on reservoir regulation for flood control, Lemon Reservoir, Florida River (a tributary to Animas River), Colorado, was prepared in accordance with instructions contained in ER 1110-2-240, EM 1110-2-3600 and EC 1110-2-67 which pertain to requirements for reports on reservoir regulation for projects subject to the provisions of Section 7 of the Flood Control Act of 1944 (58 Stat. 890). The pertinent portion of the act reads as follows:

"Hereafter it shall be the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations . . ."

b. This report contains general information pertaining to the basin and project, describes the flood control operation plan, and contains a copy of regulations for the flood control operation of this project (Appendix A).

c. A considerable portion of the material used in the preparation of this report was supplied by the U. S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

2. AUTHORIZATION

The Florida Project was authorized as one of the initial participating projects of the Colorado River Storage project by the act of 11 April 1956 (70 Stat. 105).

CHAPTER II - BASIN DESCRIPTION

3. DESCRIPTION OF THE AREA

a. Florida River has its source in the rugged Needle Mountains, at elevations of about 13,000 feet m.s.l., in the San Juan National Forest in southwestern Colorado. The river flows in a general southerly direction for about 50 miles to its confluence with the Animas River near the Colorado-New Mexico State line.

b. Lemon Reservoir drainage basin is located on the Florida River, approximately 14 miles northeast of Durango, in La Plata County. The location is about 36 miles upstream from the confluence of Florida River with Animas River, as shown on Chart 1. The Lemon Reservoir drainage area of 67.6 square miles is entirely on the Pacific slope, but is only about 7 miles from the Continental Divide at its nearest point. Elevations range from 13,147 feet at Emerson Mountain near the northeast corner of the drainage basin to 7,952 feet at the streambed elevation of Lemon Dam, averaging about 10,500 feet over the watershed. Topography of the area is shown on Chart 2. The dam and reservoir are underlain by impervious layers of shales and sandstone comprising the Carboniferous Red Beds. The dam foundation is keyed into this material, which has required extensive grouting.

c. The native vegetation of the area consists largely of piñon pine and juniper in the higher elevations and sagebrush on the lower and more level lands. Along the river, cottonwoods, sagebrush, and native grasses cover the area. The reservoir is surrounded by aspen and spruce.

d. Economy of the area is dependent mainly on grazing and agriculture. Irrigated lands downstream from the dam are utilized largely for the support of livestock enterprises widely practiced in the area. Climatologically adaptable crops, such as small grains, alfalfa, pasture, potatoes, apples, vegetables, berries, and some pinto beans are the principal crops produced. The estimated population of the valley is about 1,000. The D&RGW Railroad has one narrow-gage line from Durango, Colorado, to Farmington, New Mexico, and another narrow-gage line that connects Durango to Ignacio, Colorado. North-South U. S. Highway 550 from Montrose, Colorado, to Shiprock, New Mexico, passes through Durango. East-West U. S. Highway 160, Cortez to Alamosa, Colorado, also passes through Durango and crosses the Florida River Valley about 15 miles downstream from Lemon Dam. Locations of towns, highways, and railroads are shown on Chart 1.

4. CLIMATE

a. The climate of the Lemon Reservoir drainage basin is temperate and semi-arid. Due to the high elevation, the winters are somewhat extended. Extremes of temperature at Lemon Dam range from a minimum of -27° to a maximum of 99° . The monthly distribution of maximum, minimum, and normal or average temperatures at the representative stations is as follows:

MONTHLY MEAN TEMPERATURES (F.°)

MONTH	DURANGO EL. 6550'	VALLECITO DAM EL. 7650'	RICO EL. 8842'	SILVERTON EL. 9332'
	Max : Min : Normal 1/	Max : Min : Average 2/	Max : Min : Average 3/	Max : Min : Normal 1/
January	65 -30 25.3	58 -35 22.0	59 -33 21.3	64 -37 16.7
February	69 -27 29.7	62 -31 25.1	58 -25 22.7	61 -34 19.0
March	78 -9 45.1	69 -21 31.1	66 -20 27.8	68 -25 23.8
April	82 0 52.5	77 -6 41.1	72 -4 35.6	72 -14 33.2
May	90 15 60.6	85 16 49.2	79 8 44.7	78 0 41.9
June	97 16 67.0	92 23 57.7	87 22 51.8	96 10 49.7
July	98 33 66.0	92 36 64.6	87 27 58.3	93 20 55.1
August	99 31 59.0	90 32 62.8	87 24 57.0	92 21 54.1
September	92 20 48.7	89 22 56.4	81 14 49.8	86 6 48.2
October	85 8 36.1	81 7 46.9	78 -2 42.3	78 -12 39.0
November	74 -14 27.9	69 -10 34.7	68 -8 31.3	68 -24 26.6
December	64 -20	62 -22 25.9	58 -25 23.1	65 -32 19.3
Annual	99 -30 46.2	92 -35 43.1	87 -33 38.8	96 -37 35.6
Years of Record		31	14	

1/ Normals for all stations are climatological normals based on period 1931-1960, as published in "Climatological Data", U. S. Department of Commerce.

2/ Jan 1943 through Dec 1973.

3/ Sep 1958 through Aug 1973.

b. Precipitation over the basin commonly falls as snow during late autumn, winter, and early spring, constituting a considerable percentage of the annual precipitation over the watershed. Rain may occur over most of the basin during any month, particularly during the warmer ones. Average annual precipitation varies from about 27 inches at Lemon Dam to about 50 inches in the higher elevations. Monthly distribution of average or normal precipitation at four representative stations in or adjacent to the basin is given in the following table:

MONTHLY PRECIPITATION

	Durango		Vallecito Dam		Rico		Silverton	
	El 6550'		El 7650'		El 8842'		El 9322'	
Month	Normal Inches	1/ %	Average Inches	2/ %	Normal Inches	1/ %	Normal Inches	1/ %
January	1.61	9	2.41	9	2.46	9	1.46	6
February	1.30	7	1.57	6	2.46	9	1.67	8
March	1.49	8	2.07	8	2.49	9	2.08	9
April	1.29	7	1.81	7	2.23	9	1.76	8
May	1.13	6	1.45	6	1.61	6	1.39	6
June	.85	5	1.17	5	1.19	5	1.41	6
July	1.81	10	2.44	10	2.39	9	2.47	11
August	2.36	13	3.17	12	2.80	11	2.82	13
September	1.78	10	2.06	8	2.49	9	2.28	10
October	1.86	10	2.76	11	2.40	9	2.26	10
November	.98	6	1.70	7	1.66	6	1.16	5
December	1.63	9	2.76	11	2.31	9	1.50	8
Annual	18.04	100	25.37	100	26.49	100	22.26	100

1/ Normals for all stations are climatological normals based on the period 1931-1960, as published in "Climatological Data", U. S. Department of Commerce.

2/ Average for 30 years of record (through 1972).

Snowfall normally accumulates until about the first of April, when increasing temperatures in the lower elevations mark the beginning of the snowmelt season. Location and description of climatological stations and snow courses are shown on Chart 3. Basin snowpack data for a wet year (1952), a dry year (1967), and the average water content of the snow at four representative snow courses are given in the following tabulation:

1 APRIL SNOW SURVEY DATA

Index :	Snow Course	:Elev :	:(in	:Record:	(in	Inches):	Water Equivalent				
							(Inches)	:(%Average*)			
Number:		:Feet):	Began	:1952	1967:	1952	Average*	1967:	1952	1967	
7M6	Ironton Park	9,800	1937	66	23	22.8	13.2	6.7	173	50	
7M16	Upper Rio Grande	9,350	1936	49	8	14.8	6.9	1.8	214	26	
7M5	Cascade	8,850	1936	67	12	23.5	11.1	3.8	211	34	
7M1	Rico	8,700	1936	51	2	20.4	7.1	0.2	287	3	

* Average from data published in "Snow Survey Measurements, Colorado and New Mexico 1936-1972", U. S. Department of Agriculture, Soil Conservation Service.

5. RUNOFF CHARACTERISTICS

a. The largest volume of runoff occurs in the period April-July and is caused by snowmelt. The runoff generally begins in the latter part of March or early April at the lower elevations in the watershed. It increases in May as considerable melting occurs in the higher mountains and normally reaches a peak late in May. The monthly distribution of average runoff at the stream gaging stations downstream from the dam is as follows:

AVERAGE MONTHLY RUNOFF

MONTH	: FLORIDA RIVER : : NEAR HERMOSA :		: FLORIDA RIVER : : NEAR DURANGO :		: FLORIDA RIVER BELOW : : FLORIDA FARMERS DITCH :		: FLORIDA RIVER : : AT BONDAD :		: FLORIDA RIVER : : AT BONDAD :	
	: OA = 69.4 sq mi :		: OA = 96 sq mi :		: OA = 108 sq mi :		: OA = 221 sq mi :		: OA = 221 sq mi :	
	: Ac-Ft :	: Percent :	: Ac-Ft :	: Percent :	: Ac-Ft :	: Percent :	: Ac-Ft :	: Percent :	: Ac-Ft :	: Percent :
October	1,730	3	2,480	3	1,390	7	2,220	4	4,190	11
November	1,380	2	1,430	2	870	5	2,100	4	2,370	6
December	800	1	830	1	910	5	1,170	2	2,030	5
January	660	1	580	1	590	3	1,060	2	1,530	4
February	600	1	520	1	530	3	1,760	3	1,410	4
March	1,030	2	1,440	2	1,100	6	3,490	6	2,500	6
April	5,720	9	7,860	10	3,070	16	8,220	15	3,650	9
May	20,260	33	23,350	29	3,230	17	13,290	24	3,990	10
June	19,200	31	25,800	32	4,070	21	12,690	22	6,450	16
July	5,230	8	7,780	10	1,110	6	3,960	7	3,650	9
August	3,260	5	4,270	5	870	5	4,180	7	3,480	9
September	2,460	4	3,300	4	1,210	6	2,260	4	4,140	11
Annual	62,330	100	79,640	100	18,950	100	56,400	100	48,730	100
Apr-Jul	50,410	81	64,780	81	11,480	61	38,160	68	27,080	55
Period of Record	Oct 55-Sep 63		Oct 10-Sep 60		Oct 67-Sep 72		Oct 56-Sep 63		Oct 67-Sep 72	
Years of Record	8		42		5		7		5	

NOTES: "Florida River near Hermosa" discontinued September 1963.
"Florida River near Durango" discontinued September 1960.
"Florida River at Bondad" discontinued September 1963, reactivated October 1967.

b. A list of stream gaging stations on Florida River, their location, drainage area, and period of record is included on Chart 2.

c. Recorded and computed runoff data at these stations are given on page 7.

6. FLOOD CHARACTERISTICS

a. Floods occurring on the Florida River are of two general types: spring floods caused by acceleration of snowmelt during a warm period, and summer and fall floods caused by high-intensity rainfall, or rainfall and snowmelt combined. Spring floods are characterized by a large volume of runoff and a flat-crested hydrograph that indicates an extended peak flow. The peak flows of the summer and fall floods have higher crests but the total discharge volumes are much smaller than those of the snowmelt floods. The five greatest floods on Florida River prior to construction of Lemon Dam (1901-1960) as recorded at the gaging station, Florida River near Durango, (station discontinued in 1960) are given in the following table:

Historical Floods 1/

Florida River near Durango, Colorado							
Water Year	Momentary		Maximum	Apr-Jul Flow		Annual Flow	
	Maximum Flow		1-day Flow	Mean	Volume	Mean	Volume
	Date	(cfs)	(cfs)	(cfs)	(acre-feet)	(cfs)	(acre-feet)
1911	5 Oct	2/					
1921	16 May	2,100	1,770	451	109,050	189	136,700
1927	28 Jun	3,200	-	353	85,430	172	124,300
1949	19 Jun	2,080	1,460	398	96,270	144	104,100
1957	26 Jul	2,750	1,950	357	86,320	142	102,600

1/ See sub-paragraph 6b for information on the 1970 flood, the first that occurred since construction of Lemon Dam and Reservoir.

2/ Maximum flood known; stage and discharge not determined.

The flood of 28 June 1927 was the largest snowmelt flood (as given in the Colorado State Water Resources report dated 1939-1940). The October 1911 flood was a rainflood and the largest flood known to occur on Florida River.

b. A rare combination of meteorological events early in September 1970 resulted in flood-producing rains over the Upper Colorado Region of Arizona, Colorado, New Mexico and Utah. Large amounts of rainfall were produced over a 12 to 18 hour period beginning before noon on 5 September. Precipitation at Lemon Dam for the period of 4-6 September totalled 4.66 inches. Computed inflow into Lemon Reservoir for 5 September was 1,786 c.f.s. day or about 3,550 acre-feet. Peak inflow into Lemon Reservoir was estimated at 3,100 c.f.s. About 5,400 acre-feet of water was stored in Lemon Reservoir during the 3-day storm. Use of space incidentally available from irrigation operations permitted the outflow to be controlled to 60 cubic feet per second.

RECORDED AND COMPUTED RUNOFF DATA

DRAINAGE AREA (sq. mi.) PERIOD OF RECORD YEARS OF RECORD	FLORIDA RIVER NEAR HERMOSA				FLORIDA RIVER NEAR DURANGO				FLORIDA RIVER BELOW FLORIDA FARMERS DITCH NEAR DURANGO				FLORIDA RIVER AT BONDAD			
	69.4 Oct 1955-Sep 1963 8				96 Oct 1910-Sep 1960 42				108 Oct 1967-Sep 1972 5				221 Oct 1967-Sep 1972 12			
	Date	cfs	cfs sq mi		Date	cfs	cfs sq mi		Date	cfs	cfs sq mi		Date	cfs	cfs sq mi	
INSTANTANEOUS PEAK FLOW MEAN DAILY FLOW MAXIMUM MINIMUM MEAN	26 Jul 57	1,880	27.1		28 Jun 27	3,200	33.3		18 May 70	598	5.54		7 Jun 58	1,430	6.47	
	26 Jul 57	1,480	21.3		26 Jul 57	1,950	20.3		17 May 70	580	5.37		7 Jun 58	956	4.33	
	11,31Jan57	4	0.06		Sep,Oct56	0	0		14 Oct 68	0.70	0.01		24 Jul 59	4.6	0.02	
		86.1	1.24			110	1.15			33.6	0.31			77.8	0.35	
ANNUAL FLOW MAXIMUM MINIMUM MEAN APR-JUL FLOW MAXIMUM MINIMUM MEAN	Water-Year	ac-ft	inches		Water-Year	ac-ft	inches		Water-Year	ac-ft	inches		Water-Year	ac-ft	inches	
	1957	101,100	27.3		1920	153,000	29.8		1969	32,280	5.62		1957	106,100	9.00	
	1959	34,150	9.22		1934	27,970	5.45		1972	7,810	1.35		1959	14,300	1.21	
		62,330	16.8			79,640	15.5			18,950	3.29			49,300	4.18	
	1957	82,190	22.2		1920	134,100	26.1		1969	26,860	4.67		1957	75,000	6.36	
	1959	25,590	6.91		1934	19,930	3.89		1971	3,120	0.54		1959	6,800	0.58	
		50,420	13.6			64,780	12.6			11,475	2.00			29,650	2.52	

7. DOWNSTREAM AREA SUBJECT TO FLOODING

The overflow area downstream from the dam extends along the Florida River to its confluence with the Animas River, a distance of approximately 36 miles. The width of the area overflowed by even a very large flood is generally just a few hundred feet. The Florida River flood discharges would have only a negligible effect on the overflow area of the lower Animas River because the Florida River discharge is relatively small compared to the flows in Animas River.

CHAPTER III - PROJECT FEATURES

8. DESCRIPTION OF THE PROJECT

Lemon Dam and Reservoir are the principal features of the Florida Project, which is a participating project of the Colorado River Storage Project. The dam is located on Florida River, approximately 14 miles northeast of Durango, Colorado, in La Plata County. Lemon Reservoir provides joint-use flood control space during the snowmelt season (April-July) for the control of snowmelt floods on a forecast basis as explained in paragraph 22. Regulated releases provide irrigation for 19,450 acres of land (supplemental water for 13,720 acres and a full water supply for 5,730 acres not previously irrigated). There is a resident dam tender at Lemon Reservoir.

a. Lemon Dam is a zoned earth and rockfill structure with a height above streambed of 215 feet and a crest length of 1,360 feet at elevation 8,167 feet. The dam has a top width of 30 feet, and embankment volume of 3,042,000 cubic yards. The embankment is constructed in three zones: an impervious central zone, flanked by a pervious zone both upstream and downstream, and a miscellaneous zone in the upstream and downstream toes. A cutoff trench is provided under the impervious zone. The plan and sections of the dam are shown on Chart 4.

b. The ungated spillway is on the right abutment of the dam, and consists of an approach channel, concrete inlet structure, concrete ogee crest section, open concrete chute, concrete stilling basin, and a concrete outlet channel discharging into the Florida River. The spillway crest elevation is 8,148 feet m.s.l. The plan, profile and sections of the spillway are shown on Chart 5. Spillway discharge capacity at elevation 8,161 feet m.s.l. is 9,600 c.f.s. The spillway discharge curve is shown on Chart 6.

c. The outlet works, located in the right abutment of the dam, consist of an approach channel and a concrete intake structure with sill elevation at 8,005 feet above mean sea level. Details of the outlet works intake structure are shown on Chart 7. The concrete tower directs flow into an 8.5-foot diameter pressure tunnel, upstream from two 2.25 by 2.25-foot high-pressure tandem slide gates. Downstream from the gates is a 9-foot horseshoe-shaped tunnel which discharges into the same stilling basin used for the spillway. In addition to the high-pressure slide gates, the gate chamber also contains an 8-inch bypass pipe which is used to release flows of 20 cubic feet per second or less. This bypass line has an 8-inch high-pressure gate valve on both the inlet and outlet ends. Chart 8 shows details of the outlet works gate chamber. The capacity of the outlet works is about 900 c.f.s. at elevation 8,148 feet m.s.l. Plan and profile of the outlet works are shown on Chart 6. Outlet works discharge curves are given on Chart 9.

d. Lemon Reservoir is approximately one-half mile wide and 3 miles long, with a surface area of 622 acres at normal full pool elevation 8,148

feet m.s.l. At this elevation the reservoir storage capacity is 40,146 acre-feet, of which 354 acre-feet is dead storage, 762 acre-feet is inactive, and 39,030 acre-feet is joint use storage for conservation and flood control.

e. Pertinent data for Lemon Dam and Reservoir are given on the inside cover of this report. A map of the reservoir is shown on Chart 10. Area and capacity curves are on Chart 11, and a tabulation of areas and capacities is given in Chart 12.

9. POWER DEVELOPMENT

No hydroelectric power development exists on Florida River or in connection with the Lemon Reservoir Project.

10. RECREATION FACILITIES

San Juan National Forest camp grounds in the Lemon Reservoir area above the dam provide facilities for camping, trailer parking, group picnicking and fishing. Locations of recreation facilities in the Lemon Reservoir area are shown on Chart 10.

11. HYDROLOGIC BASIS FOR DESIGN

Preliminary studies for Lemon Reservoir Project were based on computed and estimated natural stream-flow at the dam site for the period 1928-1956. The flows shown on the pertinent data page at the front of this report are from these studies.

12. CONSTRUCTION HISTORY

The construction contract for Lemon Dam was awarded on 30 June 1961. Closure was made 14 November 1963 and all contract work was completed in December 1963.

CHAPTER IV - OPERATION FEATURES

13. RESPONSIBILITY FOR OPERATION

a. Lemon Reservoir is operated principally for irrigation and flood control. The U. S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah is responsible for operation of the dam and reservoir.

b. The flood control operation of Lemon Dam and Reservoir is accomplished in accordance with rules and regulations prescribed by the Secretary of the Army pursuant to the provisions of Section 7 of the Flood Control Act of 1944 (58 Stat. 890). A copy of these regulations is included in Appendix A to this report. Details concerning the responsibility for flood control operation of the dam and reservoir are discussed in paragraph 6 in Appendix A.

14. UPSTREAM REGULATION

There is an existing small dam creating Upper Park Reservoir in the upper reaches of the Lemon Reservoir drainage basin. The reservoir impounds runoff from the uppermost 5 square miles of the Florida River watershed. This reservoir is assumed to be filled by any major flood, therefore, there is no storage available in it for reducing flood peaks.

15. DOWNSTREAM CHANNEL CAPACITIES

The Florida River downstream from Lemon Dam to Bondad meanders over the floor of a narrow, deeply entrenched valley that generally ranges from about 1/8 to 1/2 mile in width. The safe channel capacity in this reach has been estimated to be 1,000 cubic feet per second.

16. FLOOD DAMAGES

Flows in excess of 1,000 cfs downstream from Lemon Dam cause bank erosion and some damage to diversion structures. Higher peaks can damage roads, railroads, bridges and buildings. Records of damages from past floods are incomplete; however, the snowmelt flood of 1941 with a peak discharge of 1,530 cubic feet per second at "Florida River near Durango" gage caused damages estimated at \$9,450. The estimated flood damages for the 1957 snowmelt flood were \$13,600. The 1957 peak flow at "Florida River near Durango" was 2,750 cfs. A damage flow curve is given on Chart 13.

17. PROTECTION PROVIDED

a. Lemon Reservoir Project provides a high degree of snowmelt flood protection: to about 3,000 acres of rural land, much of which is intensively developed to irrigation farming; to residential, business, and industrial facilities; to irrigation systems, utility systems, and to important highway and railroad bridges and routes.

b. The first significant flood in the Lemon Reservoir drainage basin since the construction of Lemon Dam, occurred in September 1970. The effective regulation of flow resulting from storage of floodwater in Lemon Reservoir during the September 1970 flood period provided incidental flood control benefits estimated at \$60,000. Details concerning the flood are presented in paragraph 6.

18. CONSERVATION OPERATION

During the non-irrigation season (October 16 through April 30) a minimum flow of 4 cfs will be needed to meet the requirements for fish in the river channel downstream from the dam. Releases of 20 cfs or less will be made through the 8-inch bypass line.

19. RELATION TO OTHER PROJECTS

Flood control operation of Lemon Reservoir is independent of any other flood control project.

CHAPTER V - OPERATIONAL CONTROLS

20. HYDROLOGIC FACILITIES

a. Hydrologic facilities within the Florida River drainage basin available for operation of Lemon Reservoir consist of the following:

- (1) One recording reservoir pool level gage.
- (2) Two existing stream gaging stations below the dam.
- (3) One precipitation station at the dam.

b. Twenty-seven snow courses and ten climatological stations located in the Florida River Basin and adjacent drainage basins, are available for use in preparing runoff forecasts.

c. Location and description of hydrologic facilities are given on Charts 2 and 3.

21. COORDINATION WITH OTHER AGENCIES

In order to assure that the flood control operation of Lemon Reservoir will be as effective and reasonable as possible, it is essential that the operating agency keep advised at all times of possible flood hazards, weather, and snowpack conditions, inflow to the reservoir, and flow in downstream tributaries. This requires close liaison with the National Weather Service, Soil Conservation Service, Geological Survey, the Corps of Engineers, and downstream interests, including ditch riders and diversion dam attendants.

22. FORECASTS OF INFLOW

The Regional Director is responsible for developing, and keeping current, snowmelt runoff prediction procedures. The primary parameter for flood control operation of Lemon Dam and Reservoir is forecast of snowmelt inflow. The forecasts are prepared by the Regional Office, Bureau of Reclamation, Salt Lake City, Utah. Since perfect forecasts are not possible, the difference between actual runoff and the forecast amounts, called the error, must be considered. The forecast method used is a statistical approach such that the indeterminacy can be expressed in terms of a probability statement with plus and minus confidence limits. The standard error is a measure of these confidence limits. The standard error is given with each forecast equation. The actual inflow will be within plus or minus the standard error of the forecast amount 68% of the time. The error for 90% probability is also given with each forecast equation. Forecasts are made on the first day of each month, February through June. The forecasting is adjusted by subtracting the estimated depletion for evaporation. Climatological data for precipitation stations and snow courses used in developing forecasts are given in paragraph 4. Locations and descriptions of climatological

stations and snow courses are given on Chart 3. Because the inflow forecast techniques are in a constant state of development and improvement, the following forecast equations, furnished by the U. S. Bureau of Reclamation, in use at present time, are presented only as a sample for information purposes:

FEBRUARY 1 FORECAST EQUATION - FLOW OF THE FLORIDA RIVER AT LEMON DAM

The following equation is used to forecast the April-through-July flow of the Florida River at Lemon Dam as soon as data is available after February 1:

$$Y = 18 + .35A.$$

Y is the forecast of flow of the Florida River at Lemon Dam for April through July in 1,000 acre-feet (1951-71 average for Y = 47).

A is the sum of the February 1 water content in inches at the snow courses listed below (1951-71 average for A = 84.3).

Station	February 1 Snow Water Content in Inches	
	197	1951-71 Average
Upper San Juan	= _____	= <u>20.5</u>
Upper Rio Grand	= _____	= <u>5.5</u>
Chamita	= _____	= <u>6.4</u>
Chama Divide	= _____	= <u>3.3</u>
Payrole	= _____	= <u>6.0</u>
Red River	= _____	= <u>4.8</u>
Wolf Creek Summit	= _____	= <u>18.6</u>
Spud Mountain	= _____	= <u>16.0</u>
Fenton Hill	= _____	= <u>3.1</u>
Value of A (Total)	= _____	= <u>84.3</u>

In an average year A would equal 84.3 and Y would equal $18 + .35 \times 84.3 = 47$.

The standard error is $\pm 11,000$ acre-feet and $\bar{R} = .84$.

The error for 90% probability is $\pm 19,000$ acre-feet.

MARCH 1 FORECAST EQUATION - FLOW OF THE FLORIDA RIVER AT LEMON DAM

The following equation is used to forecast the April-through-July flow of the Florida River at Lemon Dam as soon as data is available after March 1:

$$Y = 3.4 + .27A.$$

Y is the forecast of flow of the Florida River at Lemon Dam for April through July in 1,000 acre-feet (1951-71 average for Y = 47).

A is the sum of the March 1 water content in inches at the snow courses listed below (1951-71 average for A = 166).

Station	March 1 Snow Water Content in Inches	
	197	1951-71 Average
Upper San Juan	= _____	= <u>25.7</u>
Upper Rio Grand	= _____	= <u>6.9</u>
Red River	= _____	= <u>5.8</u>
Chamita	= _____	= <u>8.4</u>
Chama Divide	= _____	= <u>3.6</u>
Payrole	= _____	= <u>7.7</u>
Wolf Creek Summit	= _____	= <u>22.8</u>
Spud Mountain	= _____	= <u>20.3</u>
Lake Humphrey	= _____	= <u>6.0</u>
Mineral Creek	= _____	= <u>12.8</u>
Red Mountain	= _____	= <u>24.9</u>
Fenton Hill	= _____	= <u>3.9</u>
Lake City	= _____	= <u>7.2</u>
Bateman	= _____	= <u>9.6</u>
Value of A (Total)	= _____	= <u>165.6</u>

In an average year A would equal 166 and Y would equal $3.4 + .27 \times 166 = 47$.

The standard error is $\pm 11,000$ acre-feet and $\bar{R} = .85$.

The error for 90% probability is $\pm 19,000$ acre-feet.

APRIL 1 FORECAST EQUATION - FLOW OF THE FLORIDA RIVER AT LEMON DAM

The following equation is used to forecast the April-through-July flow of the Florida River at Lemon Dam as soon as data is available after April 1:

$$Y = -3.6 + .273A.$$

Y is the forecast of flow of the Florida River at Lemon Dam for April through July in 1,000 acre-feet (1951-71 average for Y = 47.3).

A is the sum of the April 1 water content in inches at the snow courses listed below (1951-71 average for A = 186).

Station	April 1 Snow Water Content in Inches	
	197	1951-71 Average
Upper San Juan	= _____	= <u>31.0</u>
Upper Rio Grand	= _____	= <u>7.1</u>
Lizzard Head	= _____	= <u>17.0</u>
Santa Maria	= _____	= <u>3.9</u>
Chamita	= _____	= <u>7.7</u>
Chama Divide	= _____	= <u>1.4</u>
Trout Lake	= _____	= <u>13.9</u>
Fenton Hill	= _____	= <u>3.2</u>
Lake City	= _____	= <u>8.0</u>
Bateman	= _____	= <u>11.7</u>
Wolf Creek Summit	= _____	= <u>28.9</u>
Spud Mountain	= _____	= <u>23.8</u>
Molas Lake	= _____	= <u>13.4</u>
Mineral Creek	= _____	= <u>15.2</u>
Value of A (Total)	= _____	= <u>186.2</u>

In an average year A would equal 186 and Y would equal $-3.6 + .273 \times 186 = 47.3$

The standard error is $\pm 6,000$ acre-feet and $\bar{R} = .95$.

The error for 90% probability is $\pm 11,000$ acre-feet.

MAY 1 FORECAST EQUATION - FLOW OF THE FLORIDA RIVER AT LEMON DAM

The following equation is used to forecast the May-through-July flow of the Florida River at Lemon Dam as soon as data is available after May 1:

$$Y = 5.6 + .321A.$$

Y is the forecast of flow of the Florida River at Lemon Dam for May through July in 1,000 acre-feet (1951-71 average for Y = 42.9).

A is the sum of the May 1 water content in inches at the snow courses listed below (1951-71 average for A = 116).

Station	May 1 Snow Water Content in Inches	
	197	1951-71 Average
River Springs	= _____	= <u> .9 </u>
Upper San Juan	= _____	= <u> 27.1 </u>
Cascade	= _____	= <u> 4.2 </u>
Upper Rio Grand	= _____	= <u> 2.1 </u>
Summitville	= _____	= <u> 19.7 </u>
Wolf Creek Summit	= _____	= <u> 30.6 </u>
Molas Lake	= _____	= <u> 8.1 </u>
Spud Mountain	= _____	= <u> 23.2 </u>
Value of A (Total)	= _____	= <u> 116.0 </u>

In an average year A would equal 116 and Y would equal $5.6 + .321 \times 116 = 42.9$.

The standard error is $\pm 7,000$ acre-feet and $\bar{R} = .93$.

The error for 90% probability is $\pm 12,000$ acre-feet.

JUNE 1 FORECAST EQUATION - FLOW OF THE FLORIDA RIVER AT LEMON DAM

The following equation is used to forecast the June-July flow of the Florida River at Lemon Dam as soon as data is available after June 1:

$$Y = 2.2 + .264A.$$

Y is the forecast of flow of the Florida River at Lemon Dam for June-July in 1,000 acre-feet (1956-71 average for Y = 25.1)

A is the sum of the June 1 water content in inches at the snow courses listed below (1956-71 average for A = 86.8).

Station	June 1 Snow Water Content in Inches	
	197	1956-71 Average
Wolf Creek Summit	_____ X 2 = _____	<u>24.4</u> X 2 = <u>48.8</u>
Spud Mountain	_____ X 3 = _____	<u>11.0</u> X 3 = <u>33.0</u>
Wolf Creek Pass	= _____	= <u>4.8</u>
Value of A (Total)	= _____	= <u>86.8</u>

In an average year A would equal 86.8 and Y would equal $2.2 + .264 \times 86.8 = 25.1$.

The standard error is $\pm 4,500$ acre-feet and $\bar{R} = .97$.

The error for 90% probability is $\pm 7,600$ acre-feet.

CHAPTER VI - PROJECT ACCOMPLISHMENTS

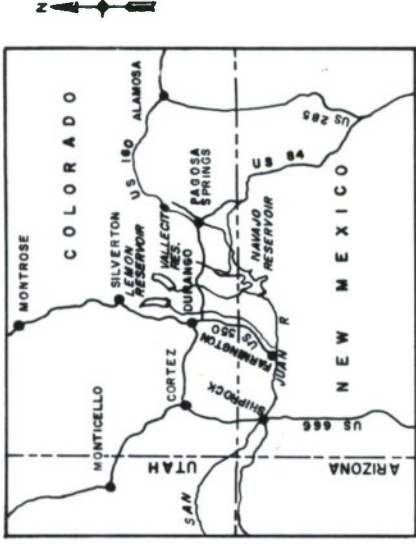
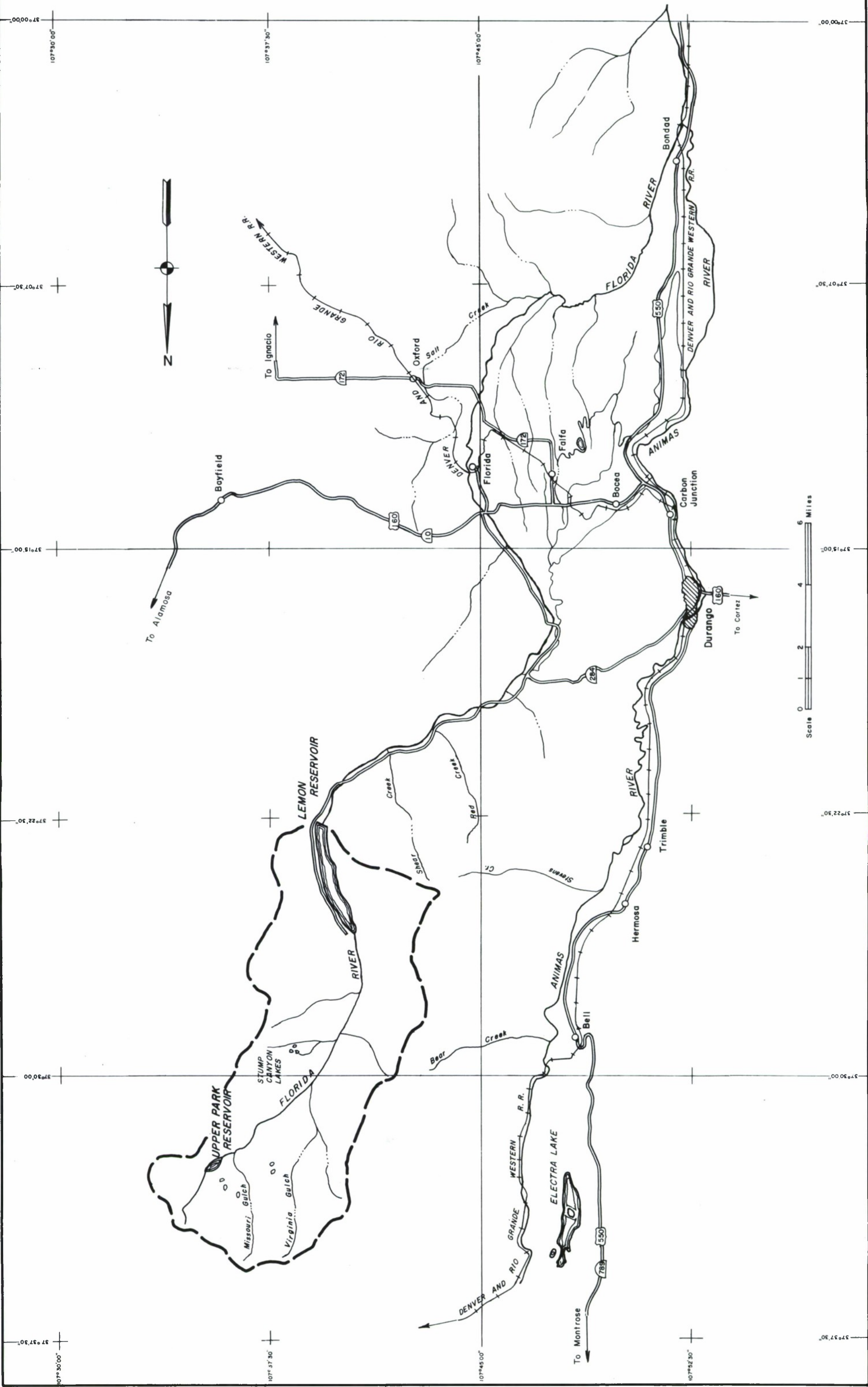
23. EXAMPLES OF OPERATION

The spillway design flood routing is shown on Chart 14. The curves and data were furnished by the U. S. Bureau of Reclamation. This flood routing was based on the assumption that, at the start of the flood, the reservoir is filled to top of Conservation Pool (elevation 8148.0) with the outlet works inoperative and all outflow discharging through the ungated spillway. A maximum storage of 48,700 acre-feet (with a maximum pool elevation of 8,161.0 feet) and a peak outflow of 9,600 cfs were obtained. Hypothetical operation of Lemon Reservoir from 1928 through 1956 is presented on Chart 15. Stage duration curves are given on Chart 16 and a stage frequency curve is on Chart 17. Seasonal variation of reservoir storage frequency is presented on Chart 18. Discharge rating curves for Florida River downstream from the dam are shown on Chart 19.

24. OPERATION RECORD

a. Operation of Lemon Reservoir began in November 1963. The record of daily storage and outflow values is maintained by the Bureau of Reclamation, Salt Lake City, Utah. The operation record for Lemon Reservoir is shown on Chart 20.

b. A record of flood control requirements, and of storage and flow pertinent to the flood control operation is contained in the monthly reports submitted to the Chief of Engineers by the District Engineer, Corps of Engineers, Sacramento, California.



VICINITY MAP

SCALE 0 10 20 30 40 50 60 70 MILES

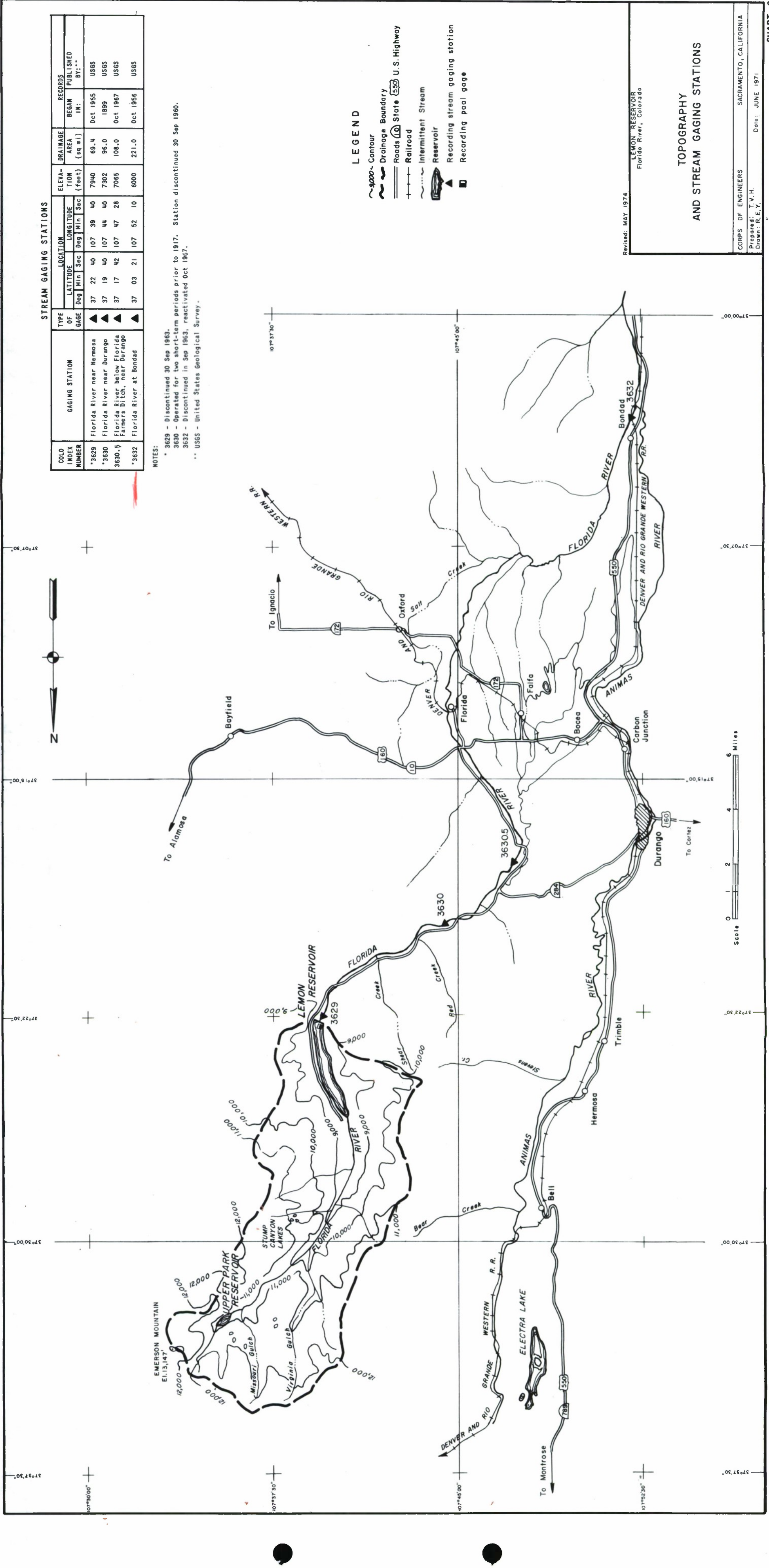
LEGEND

- Drainage Boundary
- Roads (10) State (550) U.S. Highway
- Railroad
- Intermittent Stream
- Reservoir

Revised: MAY 1974

LEMON RESERVOIR
Florida River, Colorado

GENERAL MAP



STREAM GAGING STATIONS

COLO INDEX NUMBER	GAGING STATION	TYPE OF GAGE	LOCATION						ELEVATION (feet)	DRAINAGE AREA (sq mi)	RECORDS	
			LATITUDE		LONGITUDE						BEGAN IN:	PUBLISHED BY:*
*3629	Florida River near Hermosa	▲	37	22	40	107	39	40	7940	69.4	Oct 1955	USGS
*3630	Florida River near Durango	▲	37	19	40	107	44	40	7302	96.0	1899	USGS
3630-5	Florida River below Florida Farmers Ditch, near Durango	▲	37	17	42	107	47	28	7065	108.0	Oct 1967	USGS
*3632	Florida River at Bondad	▲	37	03	21	107	52	10	6000	221.0	Oct 1956	USGS

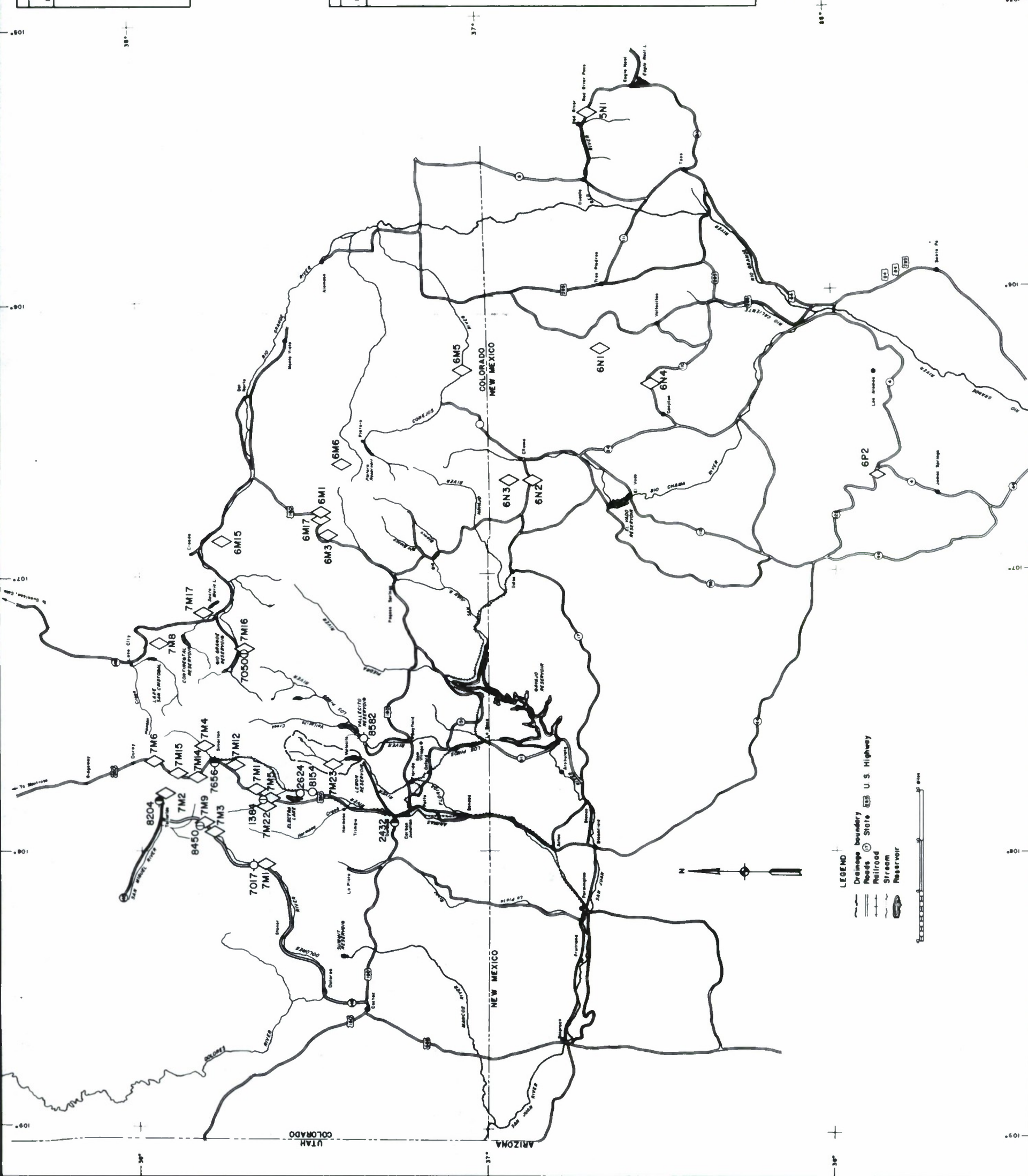
NOTES:
* 3629 - Discontinued 30 Sep 1963.
3630 - Operated for two short-term periods prior to 1917. Station discontinued 30 Sep 1960.
3632 - Discontinued in Sep 1963, reactivated Oct 1967.
** USGS - United States Geological Survey.

LEGEND

- ~9000~ Contour
- Drainage Boundary
- == Roads (10 State 550 U.S. Highway)
- Railroad
- Intermittent Stream
- Reservoir
- ▲ Recording stream gaging station
- Recording pool gage

Revised: MAY 1974
LEMON RESERVOIR
Florida River, Colorado

TOPOGRAPHY
AND STREAM GAGING STATIONS



CLIMATOLOGICAL STATIONS											
STATION	TYPE	ELEV. (feet)	LOCATION			YEAR OF RECORD			YEAR OF RECORD		
			Long	Lat	Alt.	Year	Month	Day	Year	Month	Day
1304	○	8000	37	46	107	18			75		
2042	○	8000	37	17	107	58			75		
2020	○	8000	37	33	107	48			10		
7017	○	8000	37	41	108	02			10		
7000	○	8000	37	42	107	18			81		
7004	○	8000	37	40	107	48			81		
8104	○	7000	37	41	107	47			81		
8204	○	7000	37	41	107	48			81		
8400	○	7000	37	40	107	58			81		
8500	○	7000	37	42	107	58			81		

* Climatological Station information obtained from "Climatological Data, Colorado Annual Summary 1960" published by U.S.D.A.

SNOW COURSES - ALPHABETICAL LISTING BY BASIN											
INDEX NUMBER	STATION	Sec	Top	Age	ELEV. (feet)	RECORD BEGIN (year)	AVERAGE APRIL WATER CONTENT (inches)				
							1960				
7000	Salinas River Basin	2N	418	100	10,200	1836	18.0				
7017	Lizard Head	11	110	110	8,700	1836	7.1				
7002	Tallierie	0	928	00	8,900	1836	8.8				
7000	Trout Lake	0	918	00	8,700	1836	18.0				
7000	San Juan River Basin	2N	438	00	8,900	1837	18.0				
7000	Iron Mountain	18	438	00	10,300	1840	7.7				
7010	Red Mountain Pass	18	928	00	11,000	1881	20.1				
6010	Bio Grande Basin-Colorado	08	400	1E	8,300	1840	8.0				
6005	Lake Humphrey	25	538	00	8,300	1837	5.8				
6017	Santa Maria	0	418	20	8,700	1836	8.7				
6005	Summitville	20	578	00	11,000	1836	18.1				
6010	Upper Bio Grande	18	400	00	8,300	1836	8.8				
6017	Wolf Creek Pass	4	378	2E	10,000	1836	27.0				
6005	Bio Grande Basin-New Mexico	0	208	0E	8,300	1840	11.8				
6010	Chama Divide	20	528	00	7,700	1840	1.8				
6010	Chamita	20	528	00	8,500	1841	7.8				
6010	Fenton Hill	18	400	0E	8,300	1842	8.8				
6010	Payette	18	208	7E	10,000	1840	8.2				
6010	Red River	0	208	15E	8,900	1837	8.8				
7000	San Juan River Basin	18	208	00	8,900	1839	10.8				
7000	Lemon Reservoir	18	278	70	8,700	1839	8.8				
7010	Mineral Creek	25	428	00	10,300	1851	18.8				
7010	Miles Lake	7	400	70	10,300	1851	18.8				
7002	Perogony	11	208	00	10,000	1837	18.7				
7000	Spad Mountain	10	418	70	8,900	1836	8.8				
6005	Upper San Juan	08	400	00	10,700	1851	20.1				
6017	Wolf Creek Summit	0	378	0E	11,000	1851	20.0				

* Snow Course information obtained from "Summary of Snow Survey Measurements, Colorado and New Mexico 1836-1878", published by U.S. Soil Conservation Service.

- NOTES:
1. The letter S following index number indicates Snow Pillar.
 2. The letter M following index number means soil moisture station on Snow Course.

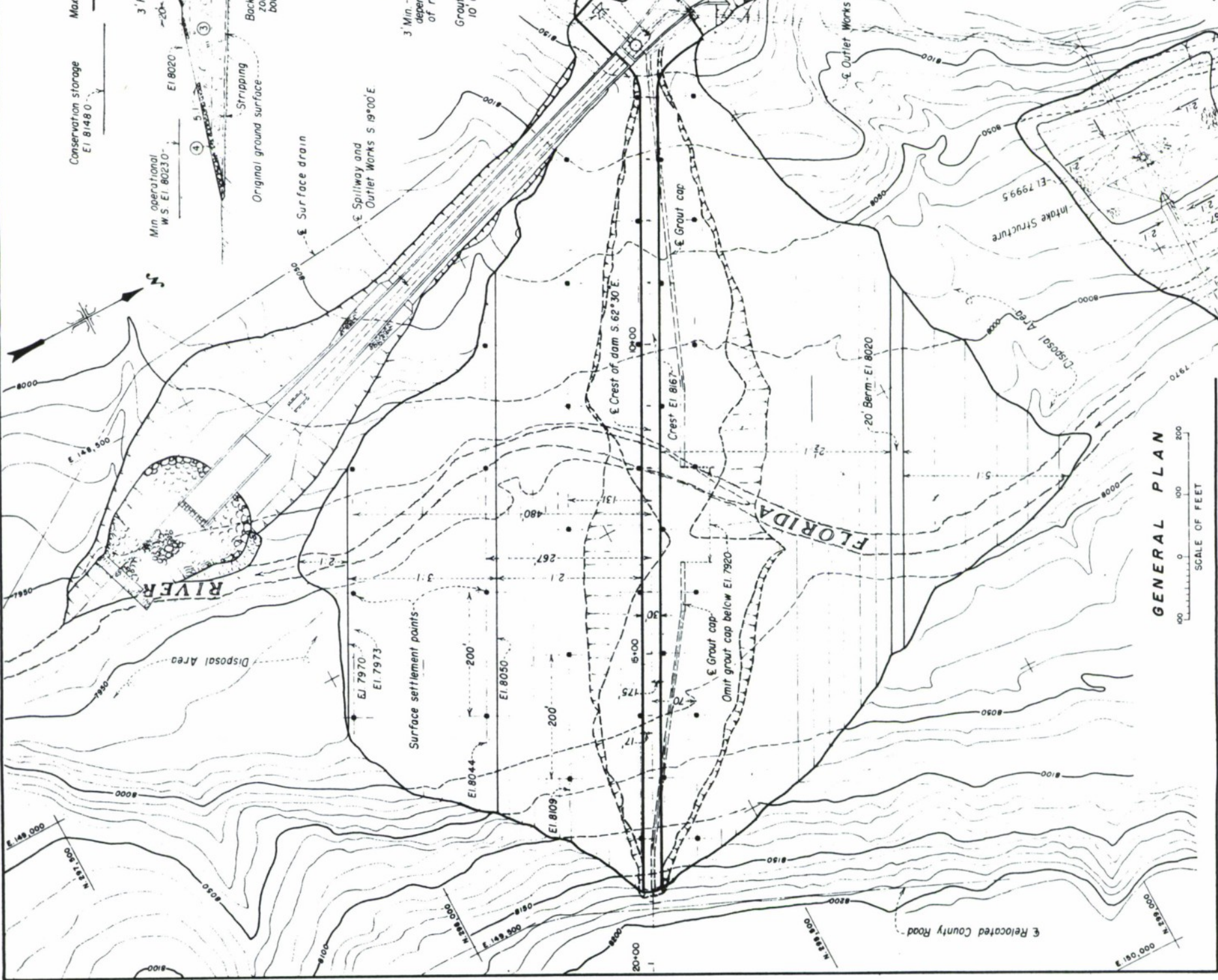
LEMON RESERVOIR
FLORIDA RIVER, COLORADO

CLIMATOLOGICAL STATIONS
AND SNOW COURSES

CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA

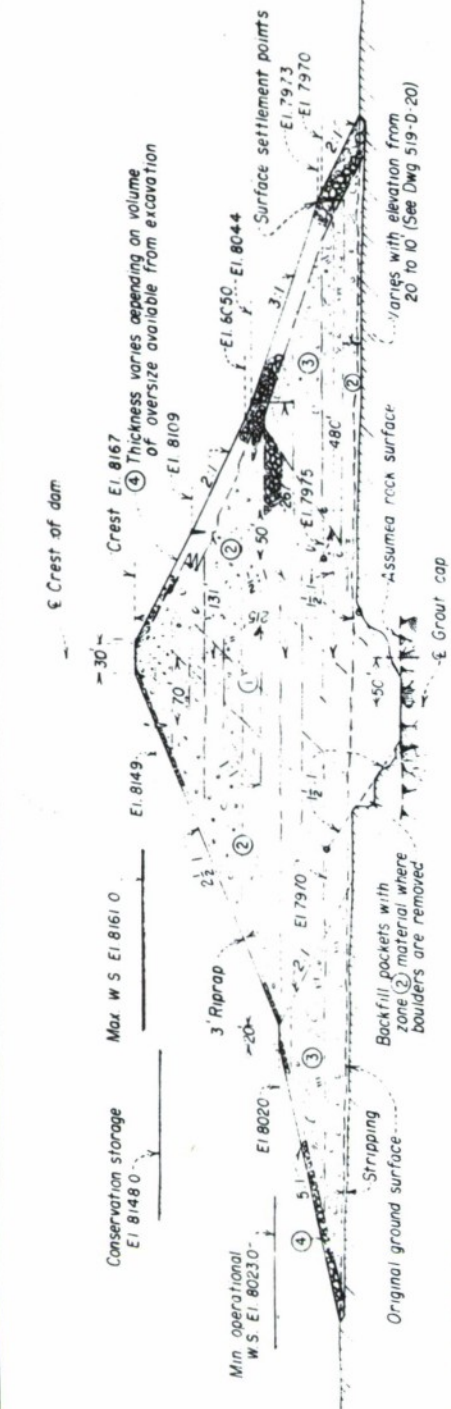
Prepared: J. J. S.
Drawn: L. H. C.

Date: MARCH 1974



GENERAL PLAN

SCALE OF FEET



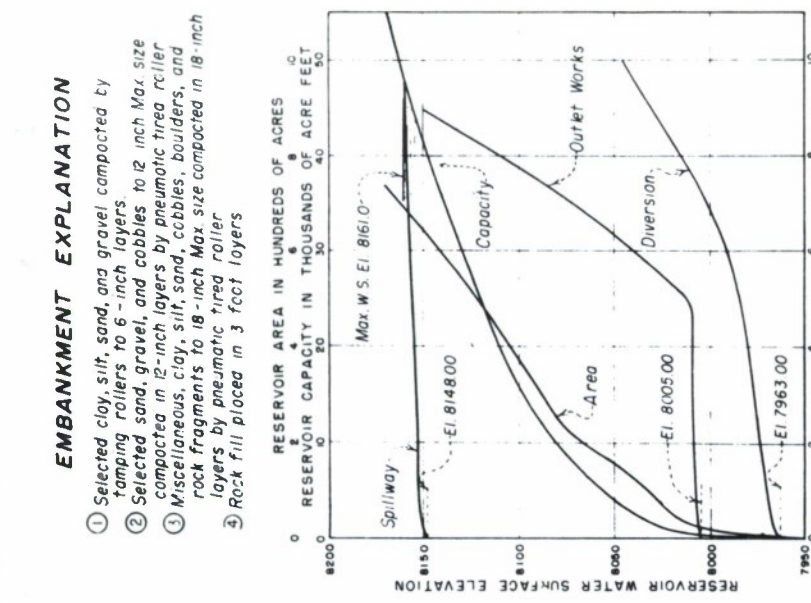
MAXIMUM SECTION

PURPOSE	ELEVATION	STORAGE
Conservation	8023 TO 8148	39,000
Inactive	8005 TO 8023	750
Dead	7955 TO 8005	350
Total storage capacity		40,100

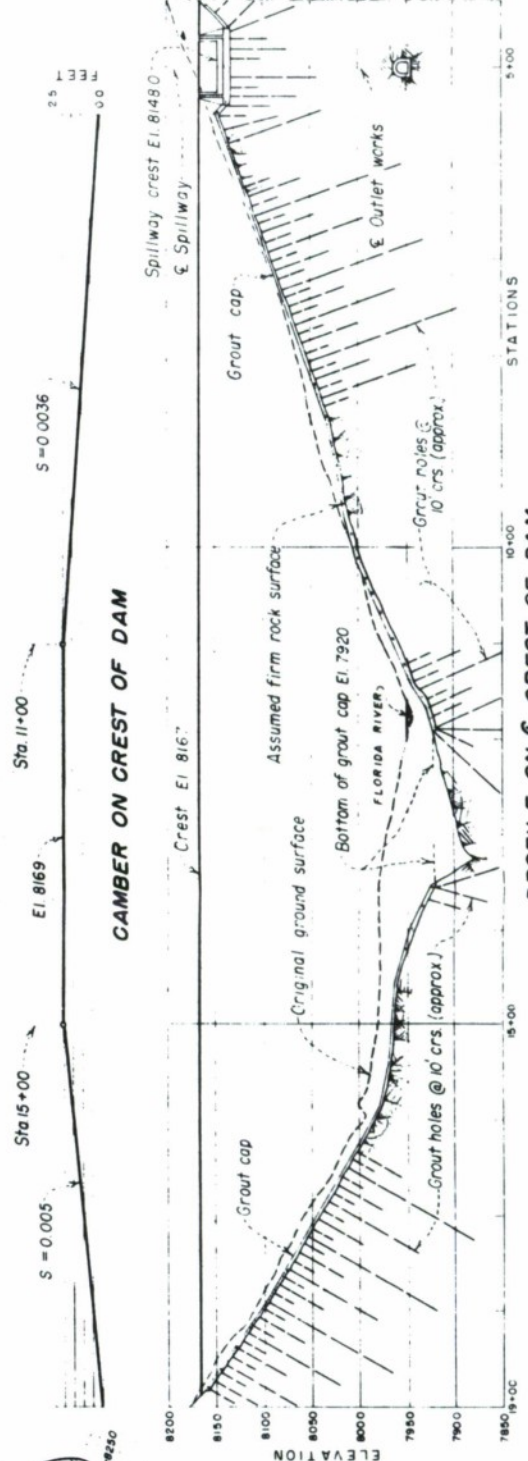
A surcharge of 8600 a f in combination with a spillway capacity of 9600 cfs is provided to protect against the inflow design flood having a peak of 13,300 cfs and a 2-day volume of 26,800 a f.

CONCRETE GROUT CAP

Sound rock
3' Min. max as directed depending on nature of rock encountered
GROUT HOLES AT 10 CRS (APPROX)
3' Min.



AREA - CAPACITY - DISCHARGE CURVES



PROFILE ON CREST OF DAM

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

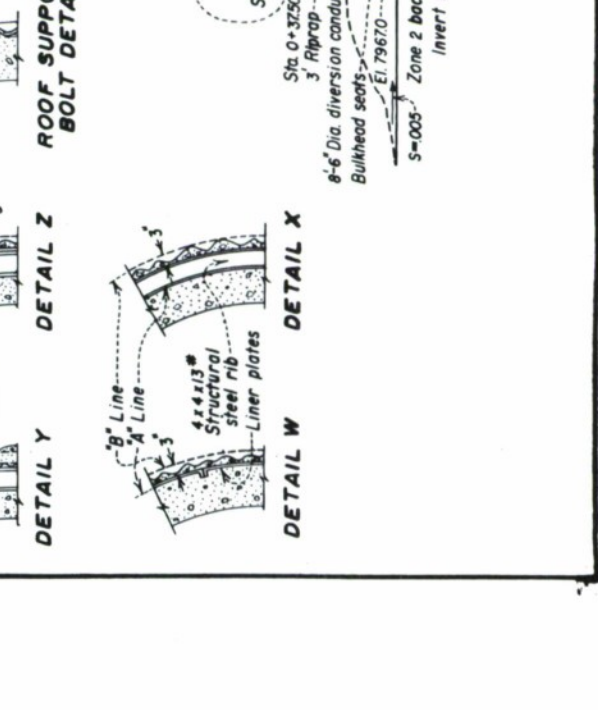
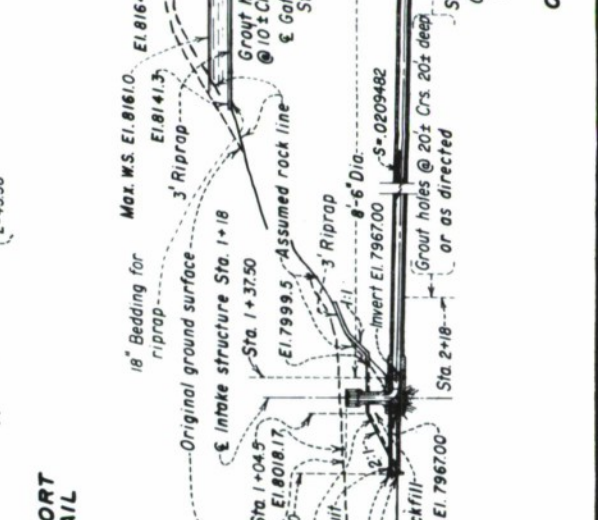
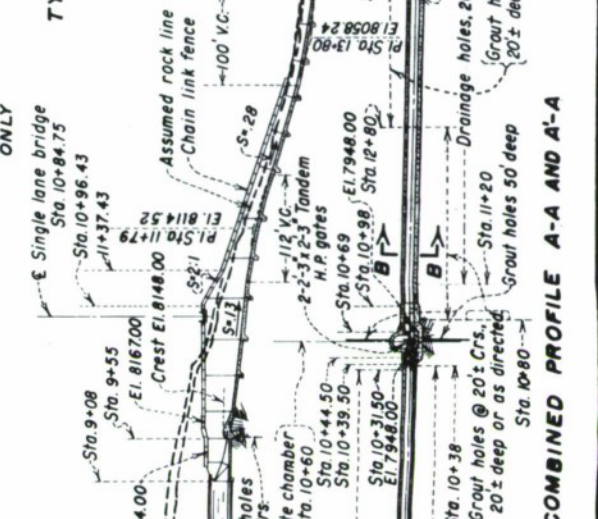
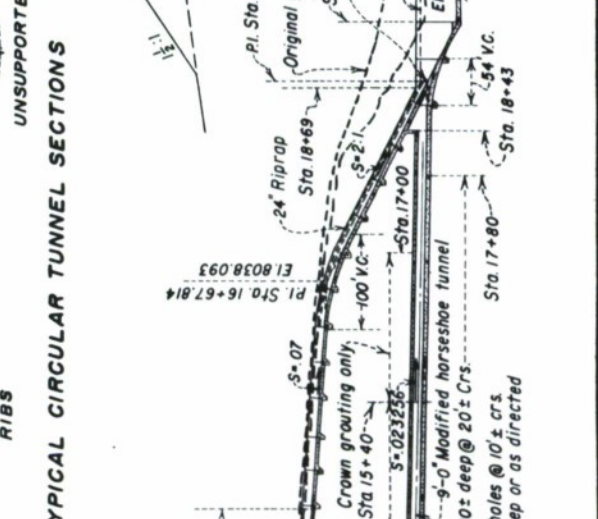
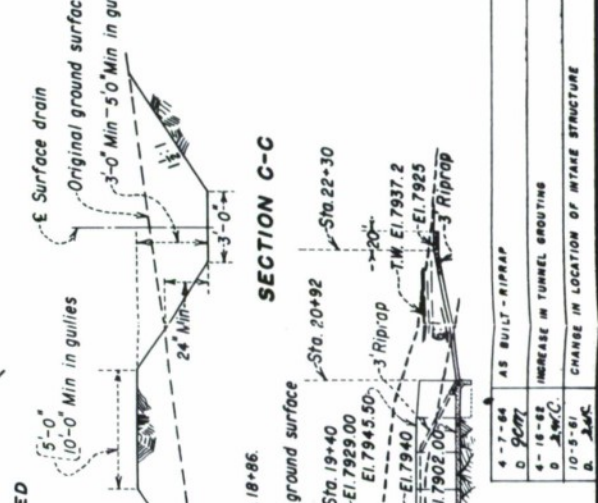
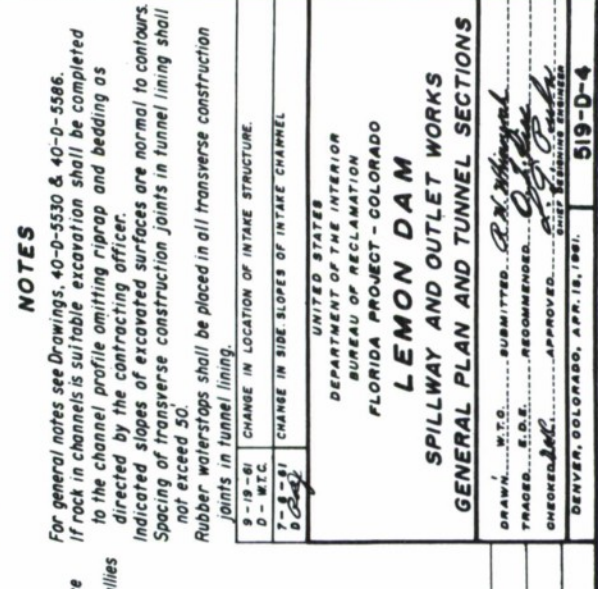
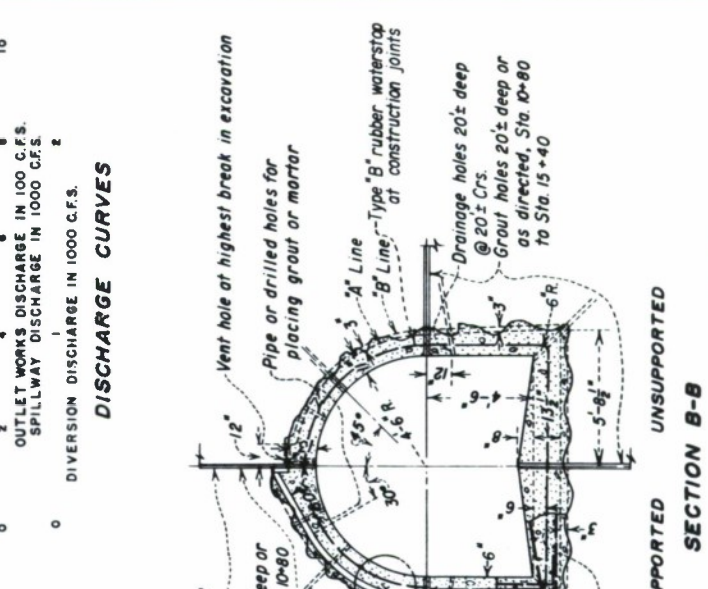
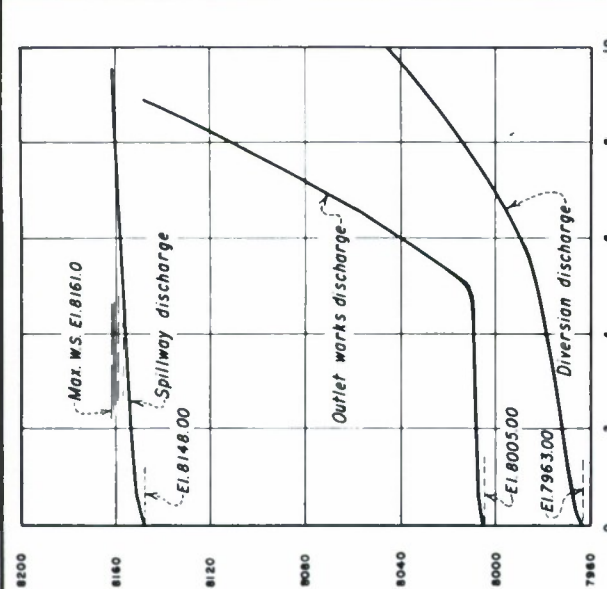
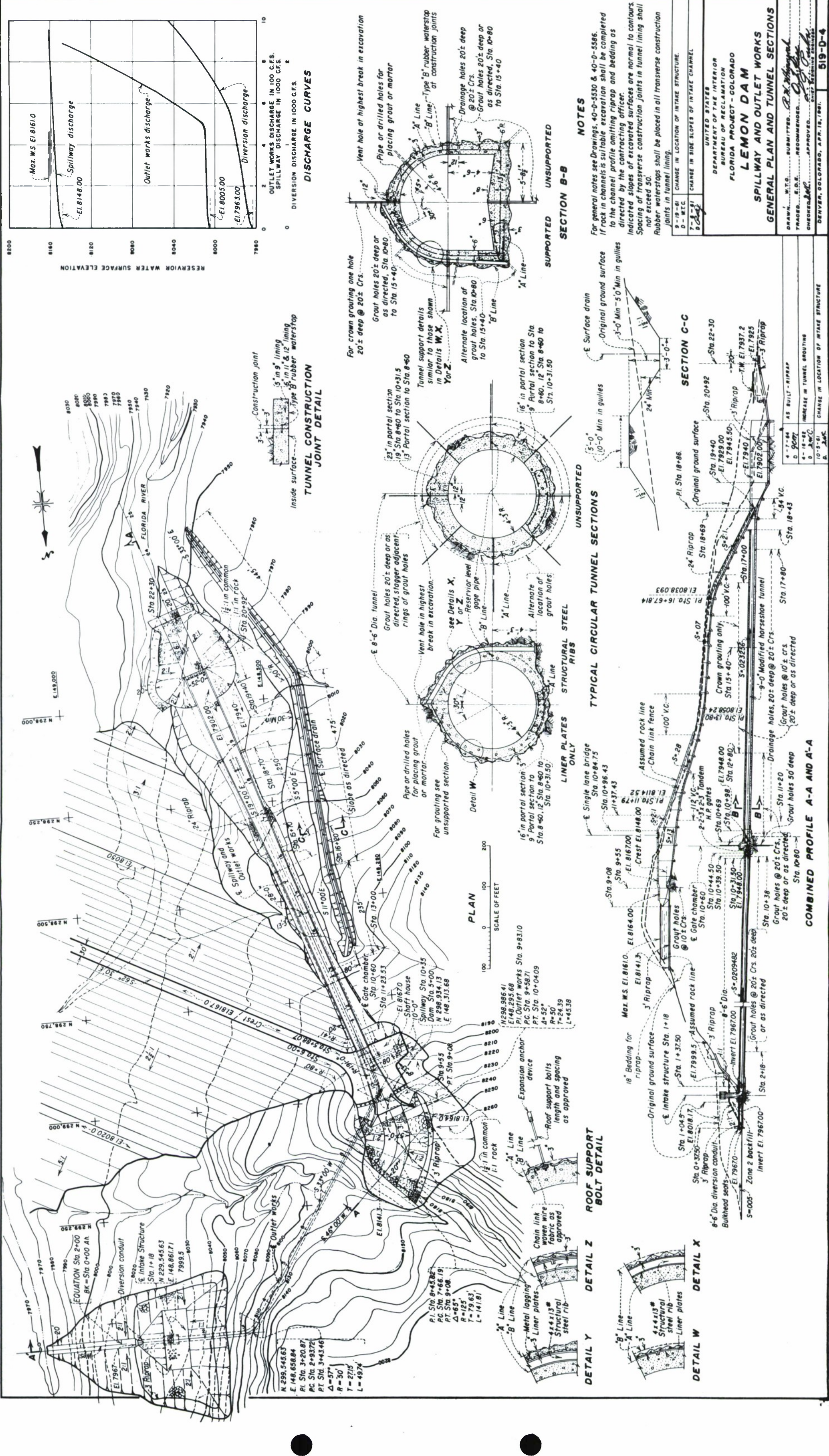
LEMON DAM

GENERAL PLAN AND SECTIONS

DRAWN: M. J. B. SUBMITTED: 8/3/56
TRACED: M. J. B. RECOMMENDED: 8/3/56
CHECKED: M. J. B. APPROVED: 8/3/56
DESIGNED: M. J. B. ENGINEER: 8/3/56

6-6-66 AS BUILT BY 406 LETTER 4-11-66
2-18-63 AS BUILT BY 406, LETTER 3-18-63
0 444

519-D-19



UNITED STATES	
DEPARTMENT OF THE INTERIOR	
BUREAU OF RECLAMATION	
FLORIDA PROJECT - COLORADO	
LEMON DAM	
SPILLWAY AND OUTLET WORKS	
GENERAL PLAN AND TUNNEL SECTIONS	
DRAWN BY	W.T.O.
TRACED BY	E.D.E.
CHECKED BY	W.T.O.
APPROVED BY	W.T.O.
DATE	APR. 12, 1931
PROJECT NO.	519-D-4

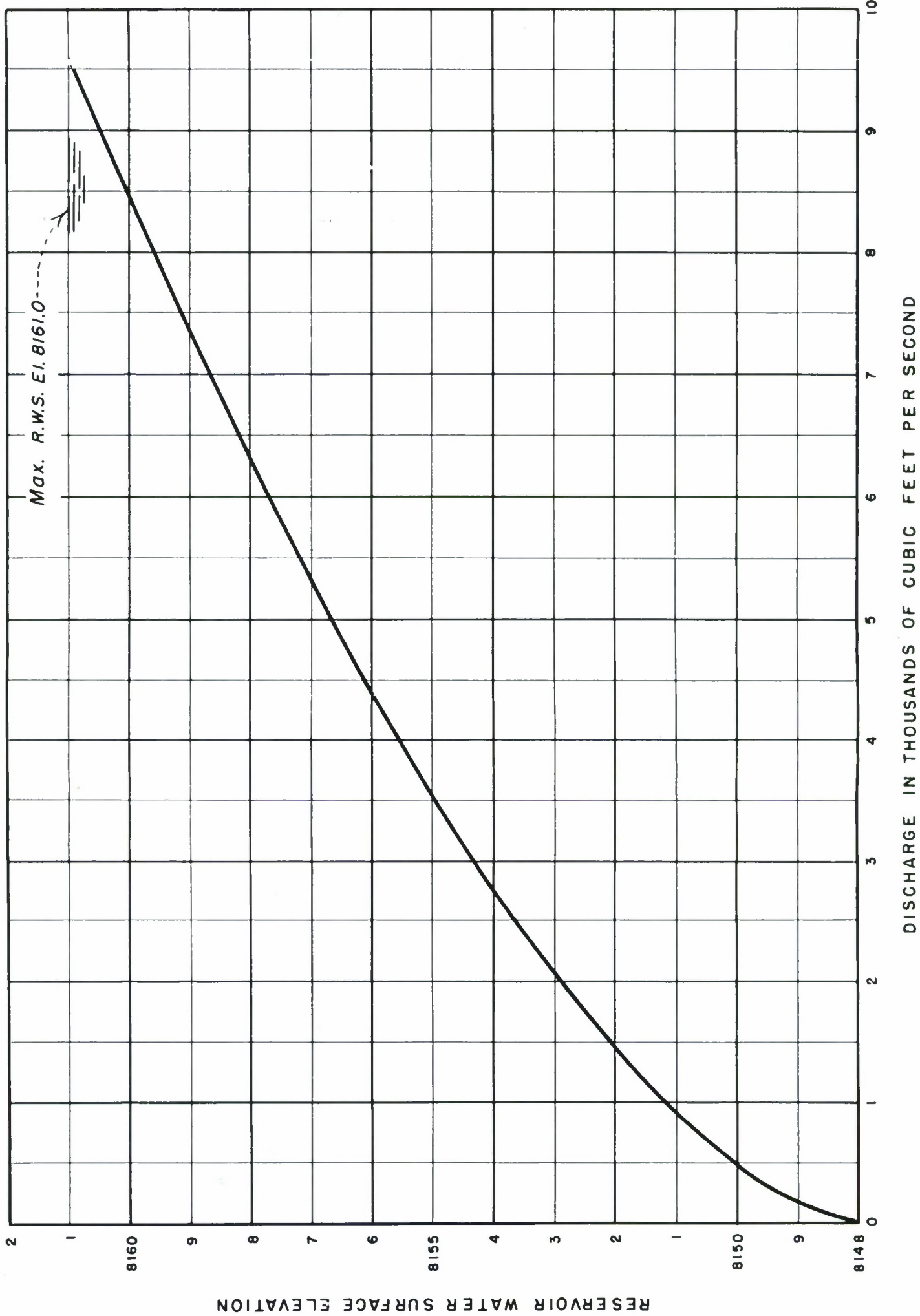
For general notes see Drawings 40-D-5330 & 40-D-5386.
If rock in channel is suitable excavation shall be completed to the channel profile omitting riprap and bedding as directed by the contracting officer.
Indicated slopes of excavated surfaces are normal to contours.
Spacing of transverse construction joints in tunnel lining shall not exceed 50.
Rubber waterstops shall be placed in all transverse construction joints in tunnel lining.

NOTES
For general notes see Drawings 40-D-5330 & 40-D-5386.
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Rubber waterstops shall be placed in all transverse construction joints in tunnel lining.



NOTE

Any variation in discharge from this curve as determined by measurements of flow downstream from the spillway should be reported to the Chief Engineer.

ALWAYS THINK SAFETY

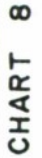
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

LEMON DAM
SPILLWAY DISCHARGE CURVE

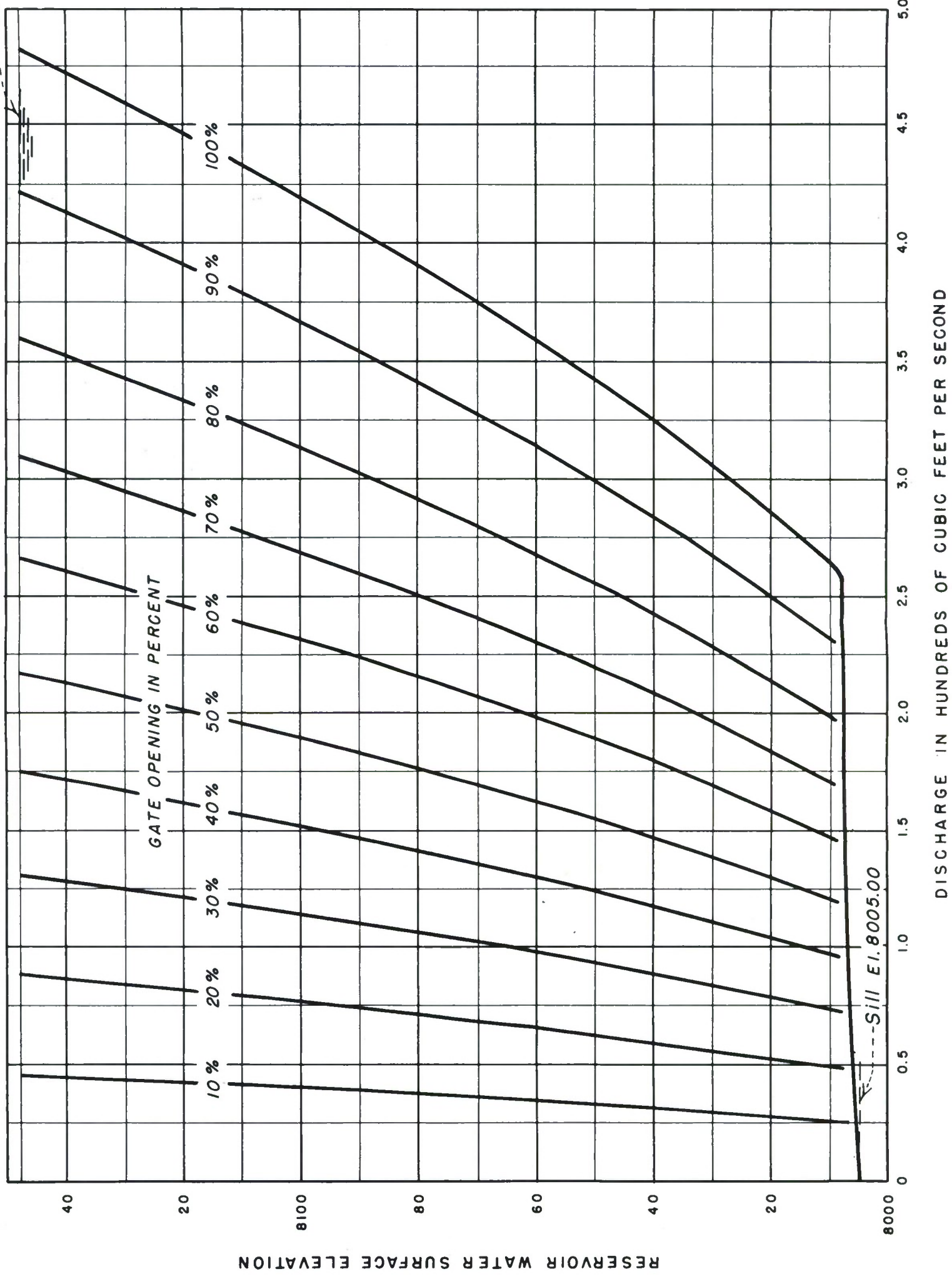
DRAWN G.G.Z. SUBMITTED Paul D. Hall
TRACED R.B.S. RECOMMENDED R.H. Williams
CHECKED R.H.B. APPROVED G.S. Loran
CHIEF DAMS BRANCH

DENVER, COLORADO, APRIL 11, 1963

519-D-198



Normal R.W.S. El. 8148.0



NOTES

Any variation in discharge from those shown as determined by measurements of flow downstream from the outlet works should be reported to the Chief Engineer. Discharges shown on the drawing are the discharges through one 2'-3" x 2'-3" H.P. gate at the gate chamber.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

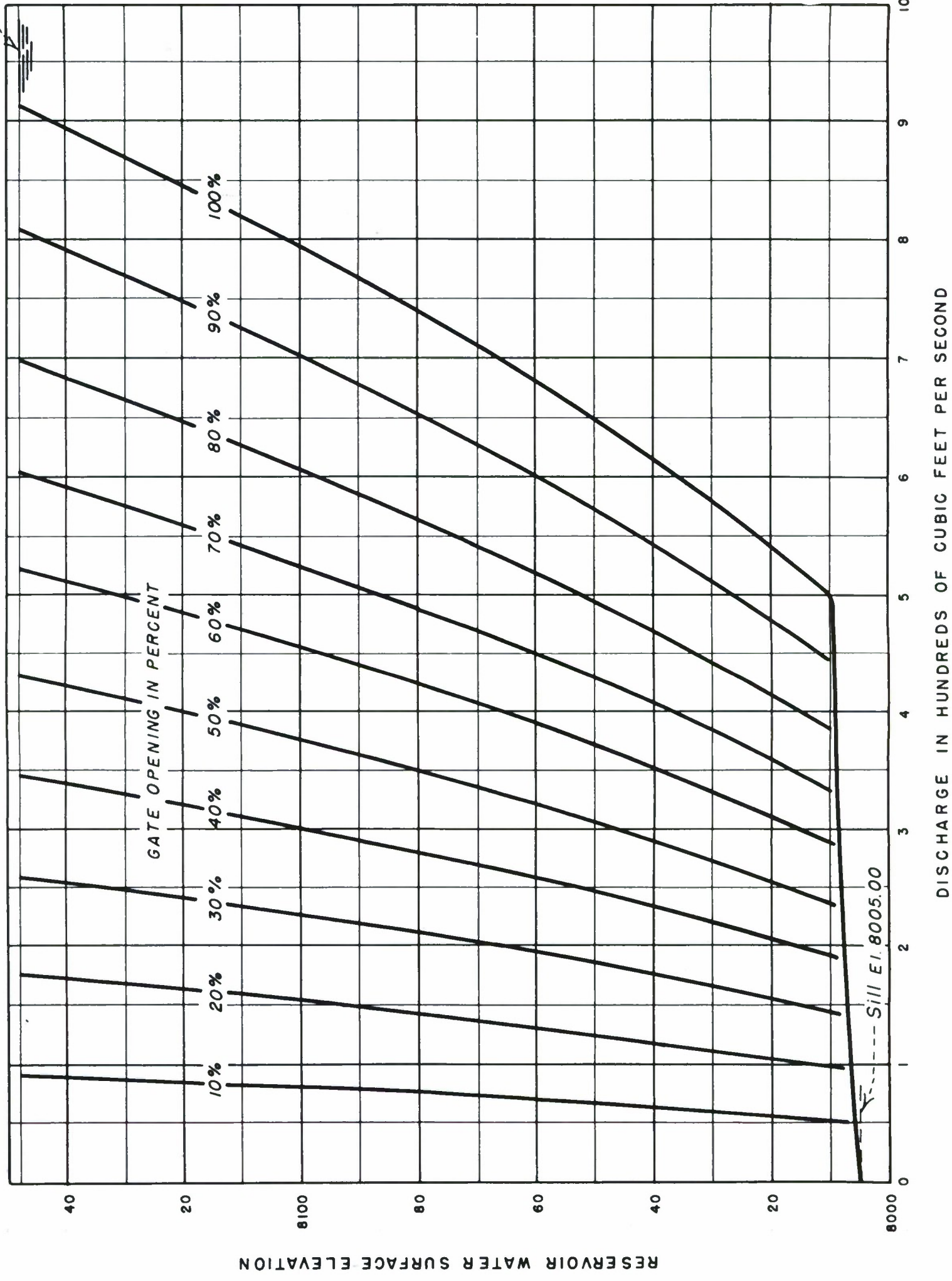
LEMON DAM

OUTLET WORKS

DISCHARGE CURVES FOR ONE 2'-3"x2'-3" H.P. GATE

DRAWN - G.G.Z. - SUBMITTED *Paul A. Ford*
TRACED - R.B.S. - RECOMMENDED *P.W. Minner*
CHECKED - *R.H.L.* - APPROVED - *R.J. KAMM*
DENVER, COLORADO, APRIL 18, 1963 519-D-200

Normal R.W.S. El. 8148.0



NOTES

Any variation in discharge from those shown as determined by measurements of flow downstream from the outlet works should be reported to the Chief Engineer. Discharges shown on the drawing are the discharges through two 2'-3" x 2'-3" H.P. gates at the gate chamber.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

LEMON DAM

OUTLET WORKS

DISCHARGE CURVES FOR TWO 2'-3" X 2'-3" H.P. GATES

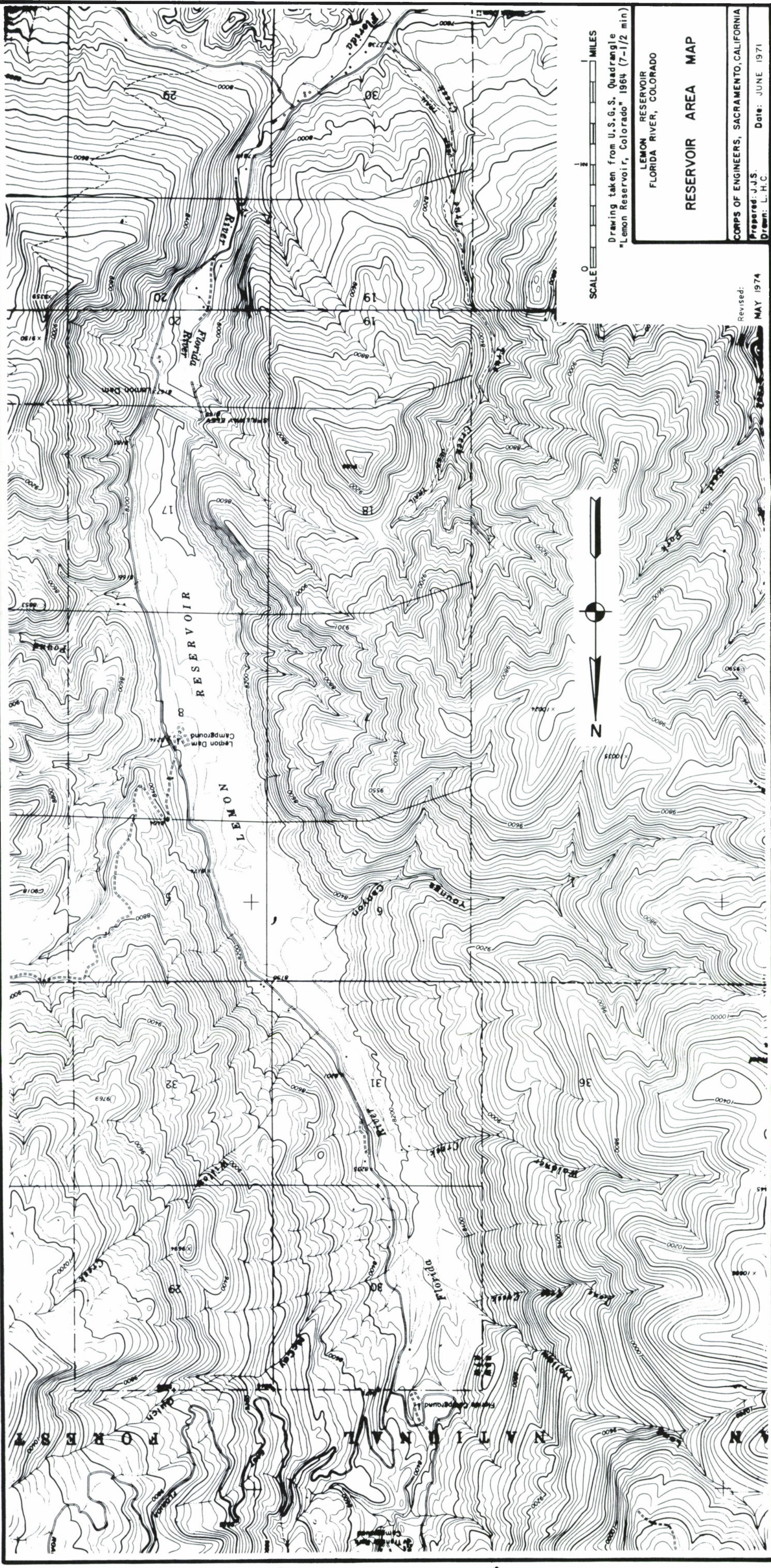
DRAWN - G.G.Z. - SUBMITTED *Paul D. Zedler*

TRACED - R.B.S. - RECOMMENDED *R. B. Smith*

CHECKED - R.H.R. - APPROVED - *R. J. Farnham*

DENVER, COLORADO, APRIL 17, 1963

519-D-199



SCALE 0 1/2 1 MILES

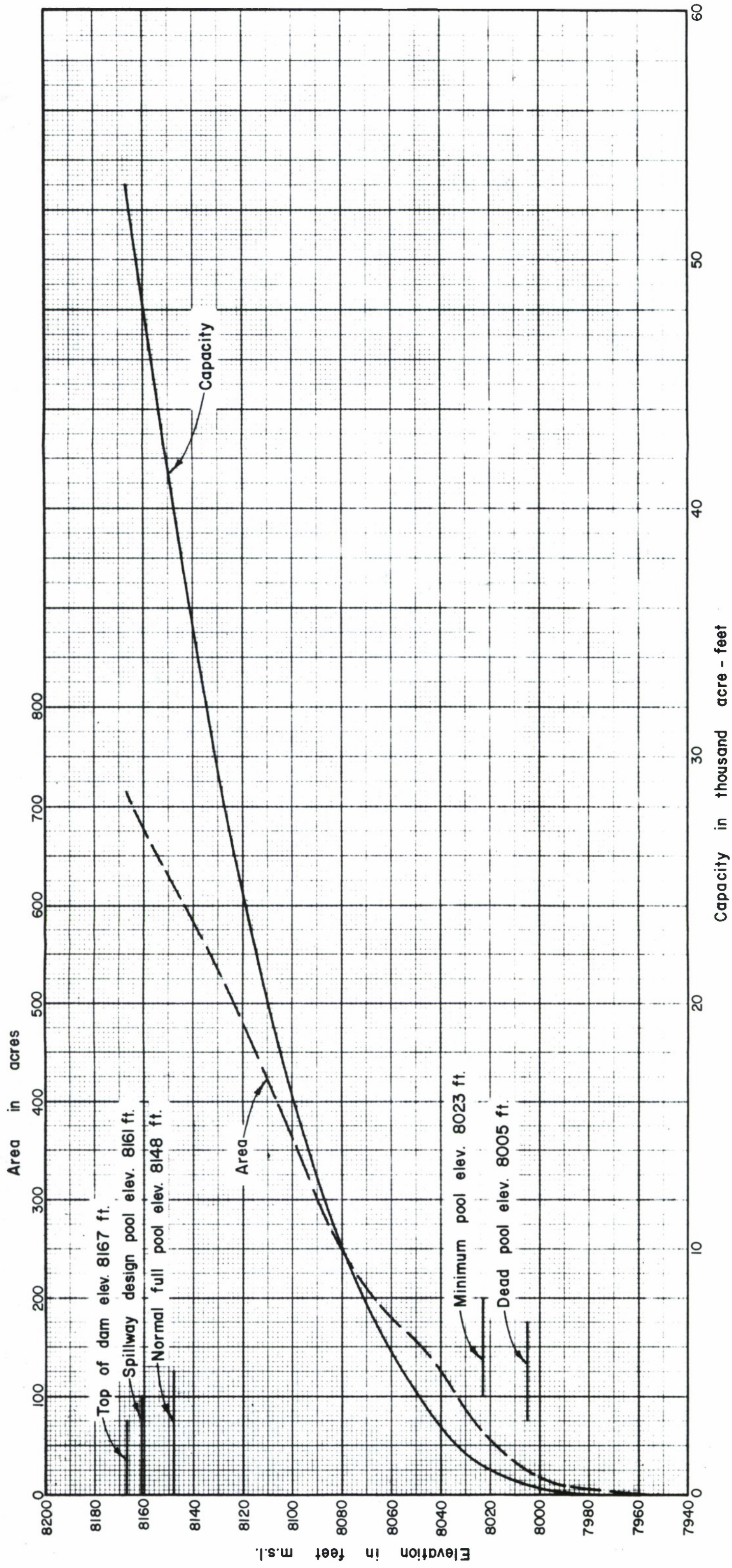
Drawing taken from U.S.G.S. Quadrangle
"Lemon Reservoir, Colorado" 1964 (7-1/2 min)

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

RESERVOIR AREA MAP

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA
Prepared: J.J.S.
Date: JUNE 1971
Drawn: L.H.C.

Revised:
MAY 1974



LEMON RESERVOIR
FLORIDA RIVER, COLORADO

AREA AND CAPACITY CURVES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H.

Draw: T.G.K.

Date: JUNE 1971

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

AREA IN ACRES

NOV. 3, 1960

Elev. in Feet		1	2	3	4	5	6	7	8	9
7950							1	1	1	1
7960	1	1	1	2	2	2	2	2	3	3
7970	3	3	4	4	4	4	5	5	5	5
7980	6	6	6	6	7	7	7	7	8	8
7990	8	8	8	9	9	9	11	12	14	15
8000	17	19	21	23	25	27	28	30	31	33
8010	34	36	37	39	41	43	45	47	50	52
8020	54	57	59	62	65	68	71	75	79	83
8030	87	91	95	99	103	107	111	114	118	121
8040	124	127	130	133	135	138	142	145	148	151
8050	154	157	159	162	164	166	169	171	174	176
8060	179	182	184	187	189	192	195	198	201	204
8070	208	212	217	222	227	233	237	241	245	249
8080	253	257	262	267	272	277	281	286	290	295
8090	301	307	313	320	327	335	342	348	354	360
8100	366	372	377	382	387	392	398	404	410	416
8110	422	428	434	440	447	453	460	467	473	480
8120	486	492	498	504	510	516	521	527	532	536
8130	541	545	550	554	558	562	566	570	574	578
8140	583	588	592	597	603	608	613	617	622	627
8150	632	637	642	648	653	659	663	667	672	676
8160	681	686	691	696	701	706	711	716	721	726
8170	731									

CAPACITY IN ACRE FEET

Elev. in Feet		1	2	3	4	5	6	7	8	9
7950							1	1	2	3
7960	4	5	7	8	10	12	14	16	19	21
7970	24	28	31	35	39	43	48	52	58	63
7980	68	74	80	87	93	100	107	114	122	129
7990	137	145	154	162	171	180	190	201	214	229
8000	245	263	283	305	328	354	382	411	442	473
8010	507	542	578	617	657	699	743	789	838	888
8020	941	997	1055	1116	1179	1245	1315	1388	1466	1547
8030	1632	1720	1813	1910	2011	2116	2225	2337	2453	2572
8040	2695	2820	2949	3080	3214	3351	3491	3634	3781	3930
8050	4083	4238	4396	4557	4719	4884	5052	5222	5394	5569
8060	5747	5927	6110	6296	6484	6674	6868	7064	7263	7465
8070	7671	7881	8096	8315	8539	8769	9004	9243	9485	9732
8080	9983	10238	10498	10762	11032	11306	11585	11868	12156	12449
8090	12747	13051	13361	13678	14001	14333	14671	15016	15367	15724
8100	16087	16456	16830	17210	17595	17984	18379	18780	19187	19600
8110	20019	20444	20875	21312	21756	22206	22662	23126	23595	24072
8120	24555	25044	25539	26041	26548	27061	27580	28104	28633	29167
8130	29705	30249	30796	31348	31904	32464	33028	33596	34168	34744
8140	35325	35911	36501	37096	37696	38301	38911	39526	40146	40770
8150	41400	42034	42674	43319	43970	44626	45287	45952	46622	47296
8160	47975	48658	49346	50039	50738	51441	52151	52864	53583	54306
8170	55035									

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
7955										1
7956	1	1	1	1	1	1	1	1	1	1
7957	1	1	1	2	2	2	2	2	2	2
7958	2	2	2	2	2	3	3	3	3	3
7959	3	3	3	3	3	4	4	4	4	4
7960	4	4	4	4	5	5	5	5	5	5
7961	5	5	6	6	6	6	6	6	6	6
7962	7	7	7	7	7	7	7	8	8	8
7963	8	8	8	9	9	9	9	9	9	10
7964	10	10	10	10	11	11	11	11	11	12
7965	12	12	12	12	13	13	13	13	13	14
7966	14	14	14	15	15	15	15	15	16	16
7967	16	16	17	17	17	17	18	18	18	18
7968	19	19	19	19	20	20	20	21	21	21
7969	21	22	22	22	23	23	23	24	24	24
7970	24	25	25	25	26	26	26	27	27	27
7971	28	28	28	29	29	29	30	30	30	31
7972	31	32	32	32	33	33	33	34	34	34
7973	35	35	36	36	36	37	37	38	38	38
7974	39	39	40	40	41	41	41	42	42	43
7975	43	44	44	44	45	45	46	46	47	47
7976	48	48	49	49	50	50	51	51	51	52
7977	52	53	53	54	54	55	55	56	57	57
7978	58	58	59	59	60	60	61	61	62	62
7979	63	63	64	65	65	66	66	67	67	68
7980	68	69	70	70	71	71	72	72	73	74
7981	74	75	75	76	77	77	78	78	79	80
7982	80	81	82	82	83	83	84	85	85	86
7983	87	87	88	89	89	90	91	91	92	93
7984	93	94	95	95	96	97	97	98	99	99
7985	100	101	101	102	103	103	104	105	106	106
7986	107	108	108	109	110	111	111	112	113	113
7987	114	115	116	116	117	118	119	119	120	121
7988	122	122	123	124	125	126	126	127	128	129
7989	129	130	131	132	133	133	134	135	136	137
7990	137	138	139	140	141	141	142	143	144	145
7991	145	146	147	148	149	150	150	151	152	153
7992	154	155	155	156	157	158	159	160	161	162
7993	162	163	164	165	166	167	168	169	169	170
7994	171	172	173	174	175	176	177	177	178	179
7995	180	181	182	183	184	185	186	187	188	189
7996	190	191	192	193	194	195	197	198	199	200
7997	201	202	204	205	206	208	209	210	211	213
7998	214	216	217	218	220	221	223	224	226	227
7999	229	230	232	233	235	237	238	240	241	243

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8000	245	247	248	250	252	254	255	257	259	261
8001	263	265	267	269	271	273	275	277	279	281
8002	283	285	287	289	291	293	296	298	300	302
8003	305	307	309	312	314	316	319	321	324	326
8004	328	331	334	336	339	341	344	346	349	352
8005	354	357	360	363	365	368	371	374	377	379
8006	382	385	388	391	394	397	399	402	405	408
8007	411	414	417	420	423	426	429	432	435	438
8008	442	445	448	451	454	457	461	464	467	470
8009	473	477	480	483	487	490	493	497	500	503
8010	507	510	514	517	520	524	527	531	535	538
8011	542	545	549	552	556	560	563	567	571	574
8012	578	582	586	590	593	597	601	605	609	613
8013	617	620	624	628	632	636	640	644	649	653
8014	657	661	665	669	673	678	682	686	690	695
8015	699	703	707	712	716	721	725	729	734	738
8016	743	747	752	757	761	766	770	775	780	784
8017	789	794	799	803	808	813	818	823	828	833
8018	838	843	848	853	858	863	868	873	878	883
8019	888	894	899	904	909	915	920	925	931	936
8020	941	947	952	958	963	969	974	980	986	991
8021	997	1003	1008	1014	1020	1026	1032	1037	1043	1049
8022	1055	1061	1067	1073	1079	1085	1091	1097	1103	1110
8023	1116	1122	1128	1135	1141	1147	1154	1160	1166	1173
8024	1179	1186	1192	1199	1205	1212	1219	1225	1232	1239
8025	1245	1252	1259	1266	1273	1280	1287	1294	1301	1308
8026	1315	1322	1329	1337	1344	1351	1359	1366	1373	1381
8027	1388	1396	1404	1411	1419	1427	1434	1442	1450	1458
8028	1466	1474	1482	1490	1498	1506	1514	1522	1530	1538
8029	1547	1555	1563	1572	1580	1589	1597	1606	1614	1623
8030	1632	1640	1649	1658	1667	1676	1684	1693	1702	1711
8031	1720	1730	1739	1748	1757	1766	1776	1785	1794	1804
8032	1813	1823	1832	1842	1852	1861	1871	1881	1890	1900
8033	1910	1920	1930	1940	1950	1960	1970	1980	1991	2001
8034	2011	2021	2032	2042	2053	2063	2074	2084	2095	2105
8035	2116	2127	2137	2148	2159	2170	2181	2192	2203	2214
8036	2225	2236	2247	2258	2269	2281	2292	2303	2315	2326
8037	2337	2349	2360	2372	2383	2395	2406	2418	2430	2441
8038	2453	2465	2477	2489	2501	2512	2524	2536	2548	2560
8039	2572	2585	2597	2609	2621	2633	2646	2658	2670	2683
8040	2695	2707	2720	2732	2745	2757	2770	2782	2795	2808
8041	2820	2833	2846	2859	2871	2884	2897	2910	2923	2936
8042	2949	2962	2975	2988	3001	3014	3027	3041	3054	3067
8043	3080	3094	3107	3120	3134	3147	3160	3174	3187	3201
8044	3214	3228	3241	3255	3269	3282	3296	3310	3323	3337

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8045	3351	3365	3379	3393	3406	3420	3434	3448	3463	3477
8046	3491	3505	3519	3533	3548	3562	3576	3591	3605	3620
8047	3634	3649	3663	3678	3692	3707	3722	3736	3751	3766
8048	3781	3796	3810	3825	3840	3855	3870	3885	3900	3915
8049	3930	3945	3961	3976	3991	4006	4022	4037	4052	4068
8050	4083	4098	4114	4129	4145	4160	4176	4191	4207	4223
8051	4238	4254	4270	4285	4301	4317	4333	4349	4364	4380
8052	4396	4412	4428	4444	4460	4476	4492	4508	4524	4541
8053	4557	4573	4589	4605	4622	4638	4654	4670	4687	4703
8054	4719	4736	4752	4769	4785	4802	4818	4835	4851	4868
8055	4884	4901	4918	4934	4951	4968	4984	5001	5018	5035
8056	5052	5069	5085	5102	5119	5136	5153	5170	5187	5204
8057	5222	5239	5256	5273	5290	5307	5325	5342	5359	5377
8058	5394	5411	5429	5446	5464	5481	5499	5516	5534	5552
8059	5569	5587	5604	5622	5640	5658	5675	5693	5711	5729
8060	5747	5765	5783	5801	5819	5837	5855	5873	5891	5909
8061	5927	5945	5964	5982	6000	6018	6037	6055	6073	6092
8062	6110	6128	6147	6165	6184	6202	6221	6240	6258	6277
8063	6296	6314	6333	6352	6370	6389	6408	6427	6446	6465
8064	6484	6503	6522	6541	6560	6579	6598	6617	6636	6655
8065	6674	6694	6713	6732	6751	6771	6790	6809	6829	6848
8066	6868	6887	6907	6926	6946	6965	6985	7005	7024	7044
8067	7064	7083	7103	7123	7143	7163	7183	7203	7223	7243
8068	7263	7283	7303	7323	7343	7364	7384	7404	7424	7445
8069	7465	7486	7506	7527	7547	7568	7588	7609	7630	7651
8070	7671	7692	7713	7734	7755	7776	7797	7818	7839	7860
8071	7881	7903	7924	7945	7967	7988	8009	8031	8053	8074
8072	8096	8117	8139	8161	8183	8205	8227	8249	8271	8293
8073	8315	8337	8359	8382	8404	8426	8449	8471	8494	8517
8074	8539	8562	8585	8608	8631	8654	8677	8700	8723	8746
8075	8769	8793	8816	8839	8863	8886	8910	8933	8957	8980
8076	9004	9028	9052	9075	9099	9123	9147	9171	9195	9219
8077	9243	9267	9291	9315	9339	9364	9388	9412	9436	9461
8078	9485	9510	9534	9559	9583	9608	9633	9657	9682	9707
8079	9732	9757	9782	9807	9832	9857	9882	9907	9932	9957
8080	9983	10008	10033	10059	10084	10110	10135	10161	10187	10212
8081	10238	10264	10290	10315	10341	10367	10393	10419	10445	10472
8082	10498	10524	10550	10577	10603	10629	10656	10682	10709	10736
8083	10762	10789	10816	10842	10869	10896	10923	10950	10977	11004
8084	11032	11059	11086	11113	11141	11168	11196	11223	11251	11278
8085	11306	11334	11361	11389	11417	11445	11473	11501	11529	11557
8086	11585	11613	11641	11670	11698	11726	11754	11783	11811	11840
8087	11868	11897	11926	11954	11983	12012	12041	12069	12098	12127
8088	12156	12185	12214	12244	12273	12302	12331	12361	12390	12420
8089	12449	12479	12508	12538	12568	12598	12627	12657	12687	12717

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8090	12747	12778	12808	12838	12868	12899	12929	12960	12990	13021
8091	13051	13082	13113	13144	13175	13206	13237	13268	13299	13330
8092	13361	13393	13424	13456	13487	13519	13550	13582	13614	13646
8093	13678	13710	13742	13774	13806	13839	13871	13904	13936	13969
8094	14001	14034	14067	14100	14133	14166	14199	14232	14266	14299
8095	14333	14366	14400	14433	14467	14501	14535	14569	14603	14637
8096	14671	14705	14739	14774	14808	14843	14877	14912	14946	14981
8097	15016	15051	15086	15121	15156	15191	15226	15261	15296	15332
8098	15367	15402	15438	15474	15509	15545	15581	15616	15652	15688
8099	15724	15760	15796	15833	15869	15905	15941	15978	16014	16051
8100	16087	16124	16161	16197	16234	16271	16308	16345	16382	16419
8101	16456	16493	16531	16568	16605	16643	16680	16718	16755	16793
8102	16830	16868	16906	16944	16982	17020	17058	17096	17134	17172
8103	17210	17248	17287	17325	17363	17402	17440	17479	17517	17556
8104	17595	17633	17672	17711	17750	17789	17828	17867	17906	17945
8105	17984	18023	18063	18102	18142	18181	18221	18260	18300	18339
8106	18379	18419	18459	18499	18539	18579	18619	18659	18699	18740
8107	18780	18821	18861	18902	18942	18983	19024	19064	19105	19146
8108	19187	19228	19269	19310	19351	19393	19434	19475	19517	19558
8109	19600	19642	19683	19725	19767	19809	19851	19893	19935	19977
8110	20019	20061	20103	20146	20188	20231	20273	20316	20358	20401
8111	20444	20487	20530	20573	20616	20659	20702	20745	20788	20832
8112	20875	20919	20962	21006	21049	21093	21137	21181	21224	21268
8113	21312	21357	21401	21445	21489	21533	21578	21622	21667	21711
8114	21756	21801	21846	21890	21935	21980	22025	22070	22115	22161
8115	22206	22251	22297	22342	22388	22433	22479	22525	22571	22616
8116	22662	22708	22754	22801	22847	22893	22939	22986	23032	23079
8117	23126	23172	23219	23266	23313	23360	23407	23454	23501	23548
8118	23595	23643	23690	23738	23785	23833	23881	23928	23976	24024
8119	24072	24120	24168	24216	24264	24313	24361	24409	24458	24506
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8121	25044	25093	25142	25192	25241	25291	25340	25390	25440	25489
8122	25539	25589	25639	25689	25739	25789	25839	25889	25940	25990
8123	26041	26091	26141	26192	26243	26293	26344	26395	26446	26497
8124	26548	26599	26650	26701	26752	26804	26855	26906	26958	27009
8125	27061	27113	27164	27216	27268	27320	27371	27423	27475	27528
8126	27580	27632	27684	27736	27789	27841	27893	27946	27998	28051
8127	28104	28156	28209	28262	28315	28367	28420	28473	28526	28579
8128	28633	28686	28739	28792	28846	28899	28952	29006	29059	29113
8129	29167	29220	29274	29328	29381	29435	29489	29543	29597	29651
8130	29705	29759	29814	29868	29922	29976	30031	30085	30140	30194
8131	30249	30303	30358	30412	30467	30522	30577	30631	30686	30741
8132	30796	30851	30906	30961	31016	31072	31127	31182	31237	31293
8133	31348	31404	31459	31515	31570	31626	31681	31737	31793	31848
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FLORIDA PROJECT - COLORADO LEMON RESERVOIR

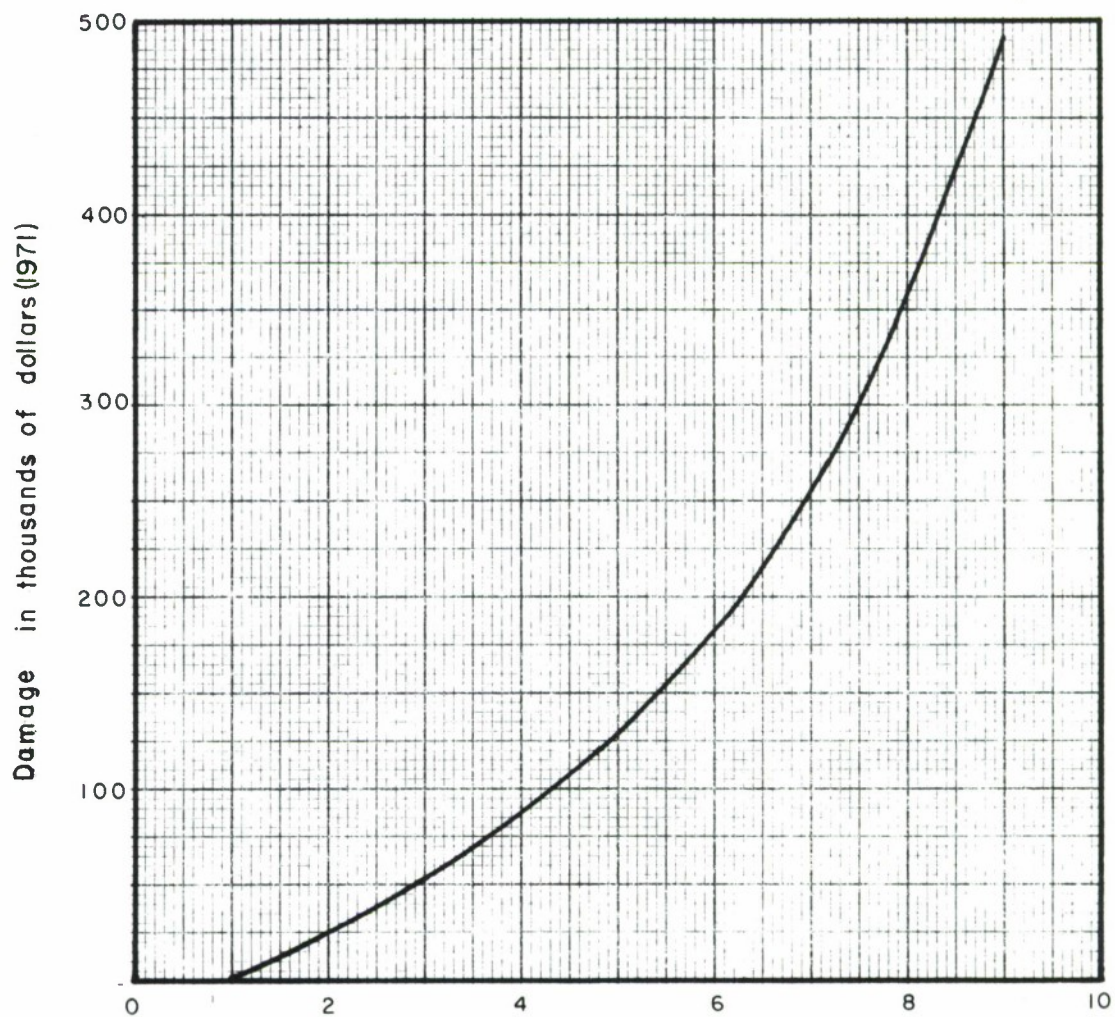
CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8135	32464	32520	32577	32633	32689	32746	32802	32859	32915	32972
8136	33028	33085	33141	33198	33255	33312	33368	33425	33482	33539
8137	33596	33653	33710	33767	33824	33882	33939	33996	34053	34111
8138	34168	34226	34283	34341	34398	34456	34513	34571	34629	34687
8139	34744	34802	34860	34918	34976	35034	35092	35151	35209	35267
8140	35325	35384	35442	35500	35559	35617	35676	35734	35793	35852
8141	35911	35969	36028	36087	36146	36205	36264	36323	36382	36441
8142	36501	36560	36619	36679	36738	36797	36857	36917	36976	37036
8143	37096	37155	37215	37275	37335	37395	37455	37515	37575	37635
8144	37696	37756	37816	37877	37937	37998	38058	38119	38179	38240
8145	38301	38362	38423	38484	38544	38605	38667	38728	38789	38850
8146	38911	38972	39034	39095	39157	39218	39280	39341	39403	39464
8147	39526	39588	39650	39712	39773	39835	39897	39959	40021	40084
8148	40146	40208	40270	40333	40395	40457	40520	40582	40645	40708
8149	40770	40833	40896	40959	41021	41084	41147	41210	41273	41337
8150	41400	41463	41526	41590	41653	41716	41780	41843	41907	41971
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8152	42674	42738	42803	42867	42931	42996	43060	43125	43190	43254
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8157	45952	46019	46086	46153	46220	46287	46354	46421	46488	46555
8158	46622	46689	46756	46824	46891	46958	47026	47093	47161	47228
8159	47296	47364	47431	47499	47567	47635	47703	47771	47839	47907
8160	47975	48043	48111	48179	48248	48316	48384	48453	48521	48590
8161	48658	48727	48795	48864	48933	49002	49070	49139	49208	49277
8162	49346	49415	49485	49554	49623	49692	49762	49831	49900	49970
8163	50039	50109	50179	50248	50318	50388	50458	50528	50598	50668
8164	50738	50808	50878	50948	51018	51089	51159	51229	51300	51370
8165	51441	51513	51584	51654	51725	51796	51867	51938	52009	52080
8166	52151	52222	52293	52364	52436	52507	52578	52650	52721	52793
8167	52864	52936	53008	53079	53151	53223	53295	53367	53439	53511
8168	53583	53655	53727	53799	53872	53944	54016	54089	54161	54234
8169	54306	54379	54452	54524	54597	54670	54743	54816	54889	54962
8170	55035									

NOTES:

1. Table was furnished by the U.S. Bureau of Reclamation, Region 4.
2. Minimum pool elevation 8023 ft.
3. Normal full pool elevation 8148 ft.
4. Top of dam elevation 8167 ft.



Peak discharge in thousands of cubic feet per second

LEMON RESERVOIR
Florida River, Colorado

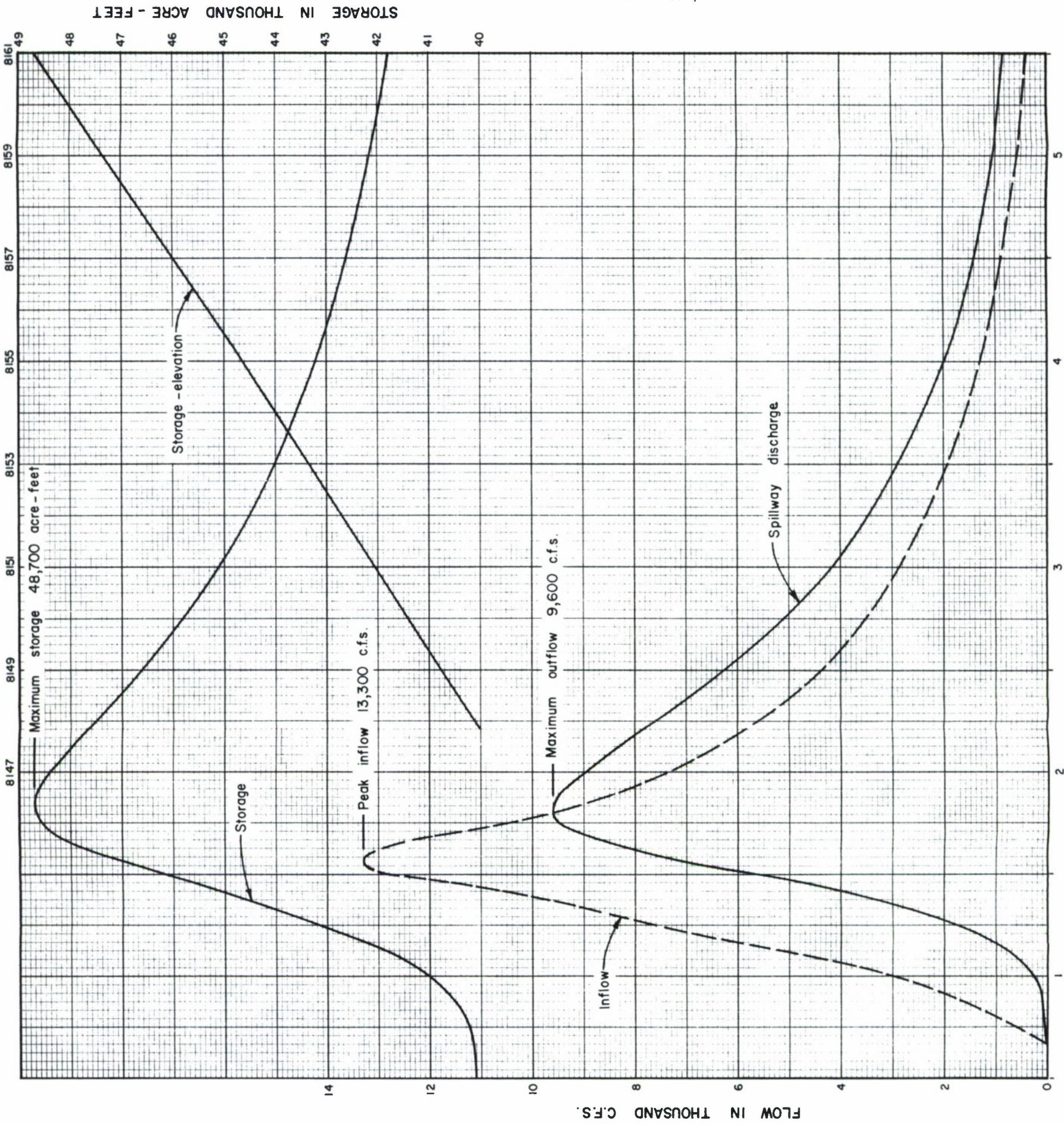
DAMAGE FLOW CURVE
FLORIDA RIVER
LEMON DAM TO
ANIMAS RIVER, COLORADO

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: J.L.K.
Drawn: R.E.Y.

Date: June 1971

RESERVOIR WATER SURFACE ELEVATION IN FEET



STORAGE IN THOUSAND ACRE - FEET

NOTES:

1. Maximum water surface elevation 8161.0 with a surcharge of 8,600 acre-feet.
2. Outlet works not used in routing of flood.
3. Flood routing starts with reservoir filled to top of conservation storage at elevation 8148.0.
4. Curves and data furnished by U.S. Bureau of Reclamation.

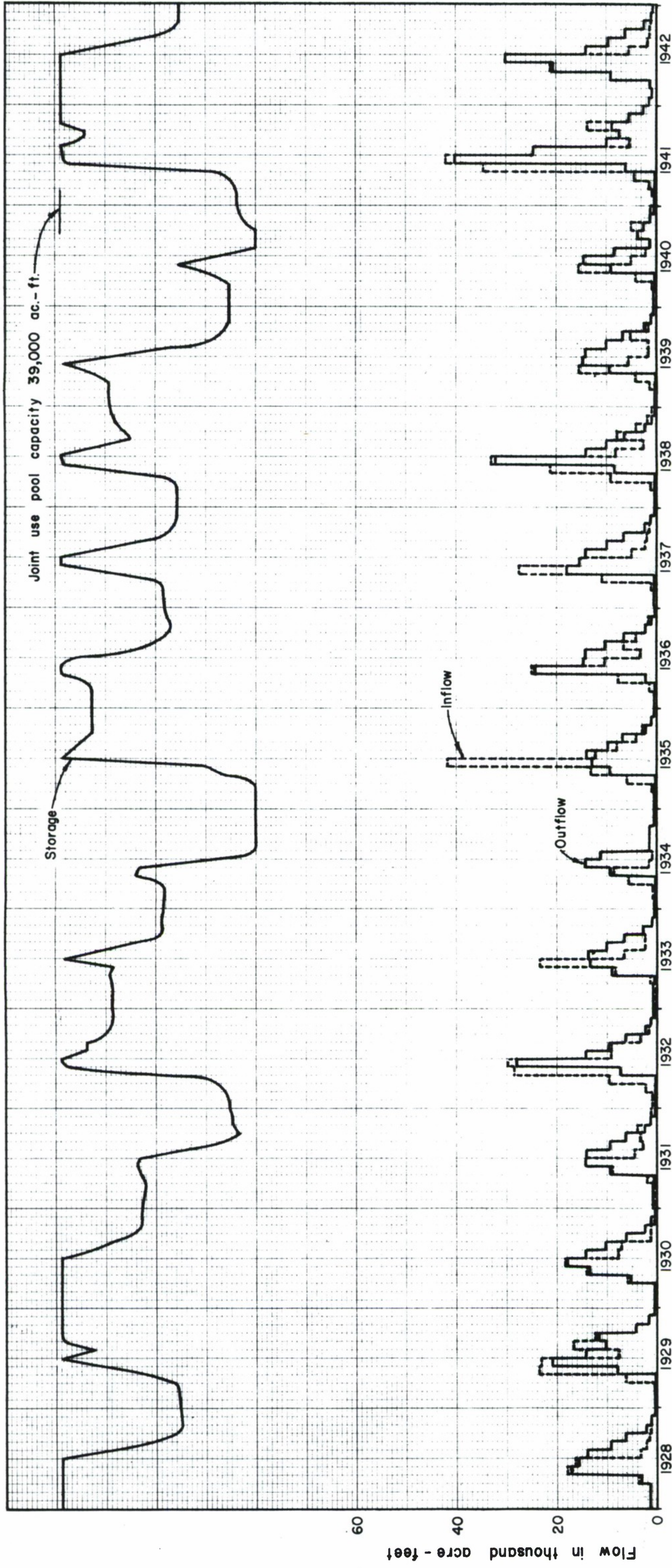
LEMON RESERVOIR
FLORIDA RIVER, COLORADO

SPILLWAY DESIGN FLOOD
ROUTING

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H. Date: SEPTEMBER 1971
Drawn: T.G.K.

Active storage in thousand acre-feet



NOTE:
Data furnished by U.S. Bureau of Reclamation.

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

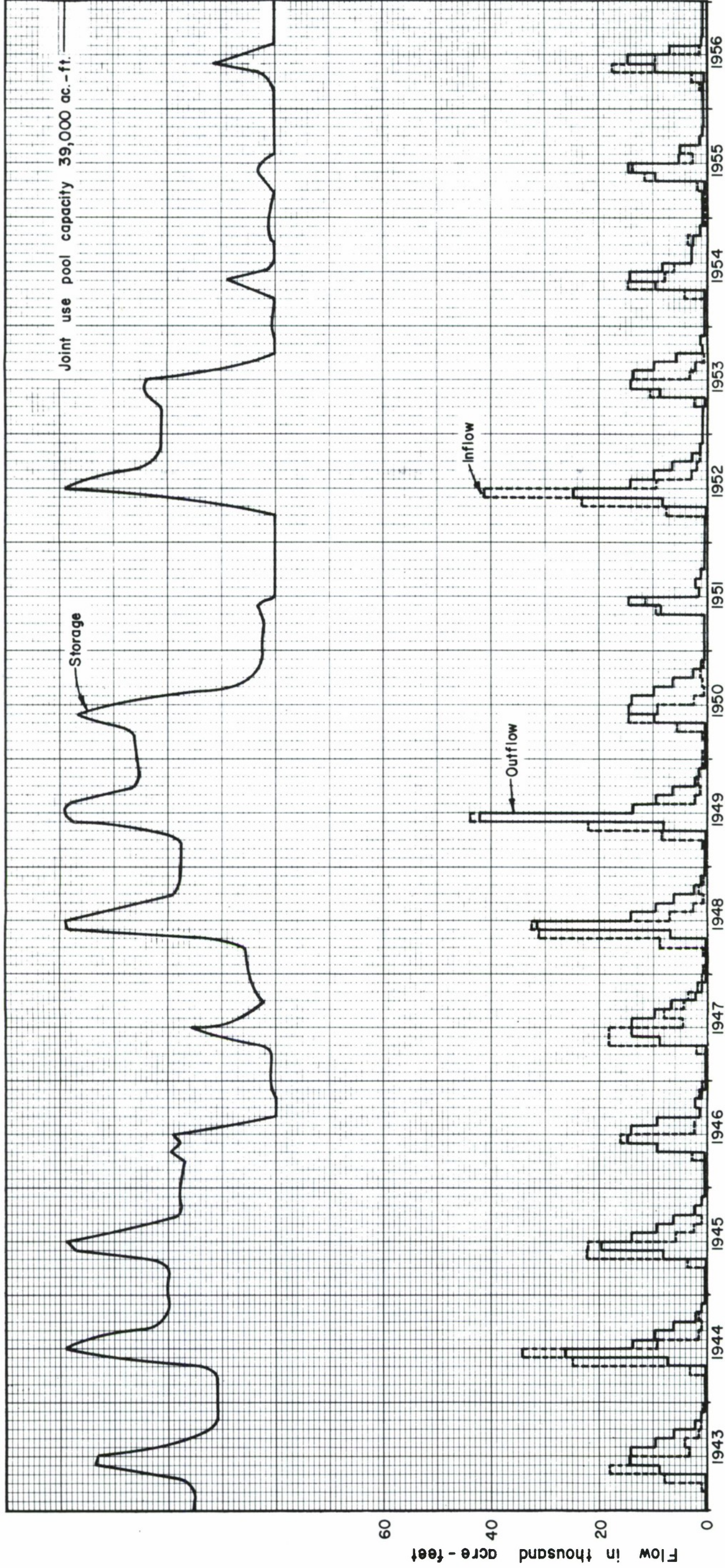
HYPOTHETICAL OPERATION

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

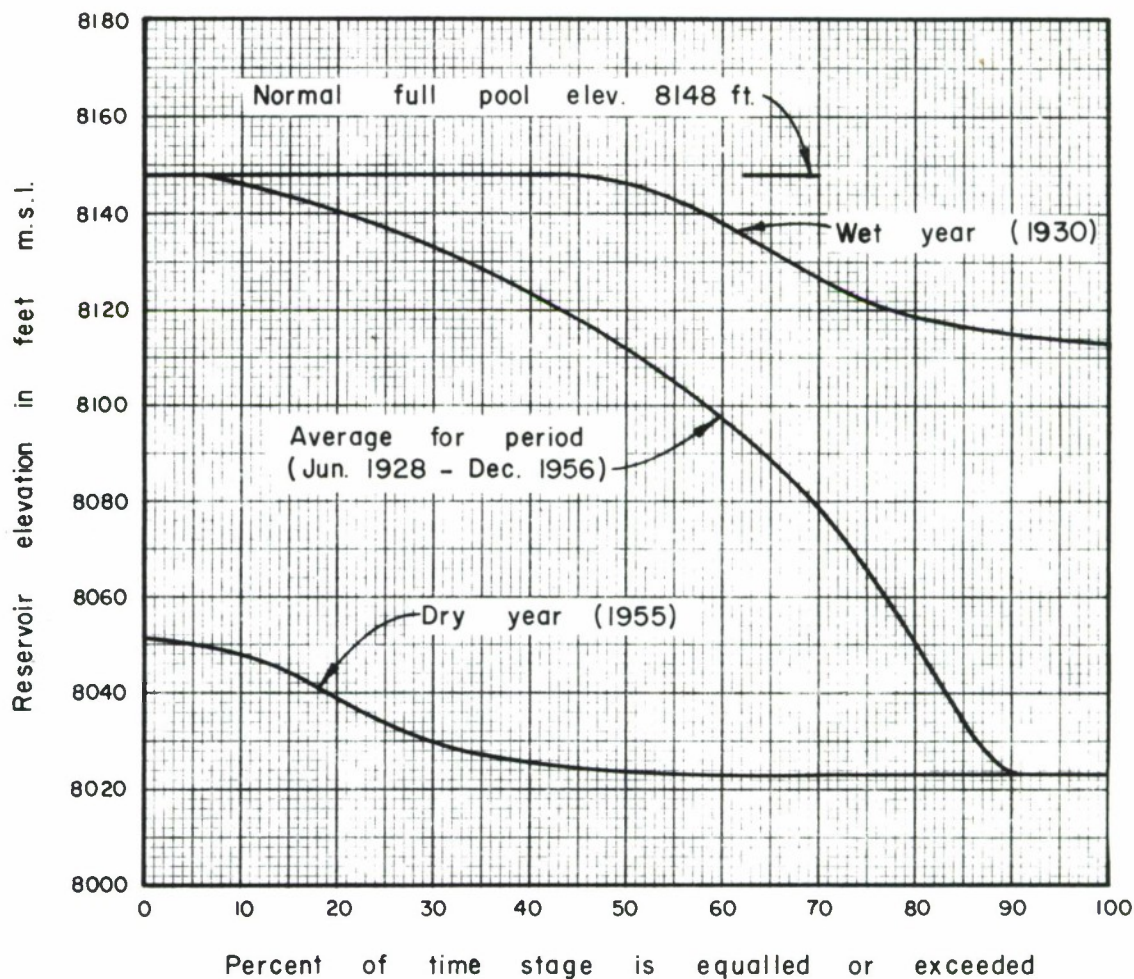
Prepared: T.V.H.
Drawn: T.G.K.

Date: JUNE 1971

Active storage in thousand acre-feet



NOTE: Data furnished by U.S. Bureau of Reclamation.



LEMON RESERVOIR
FLORIDA RIVER, COLORADO

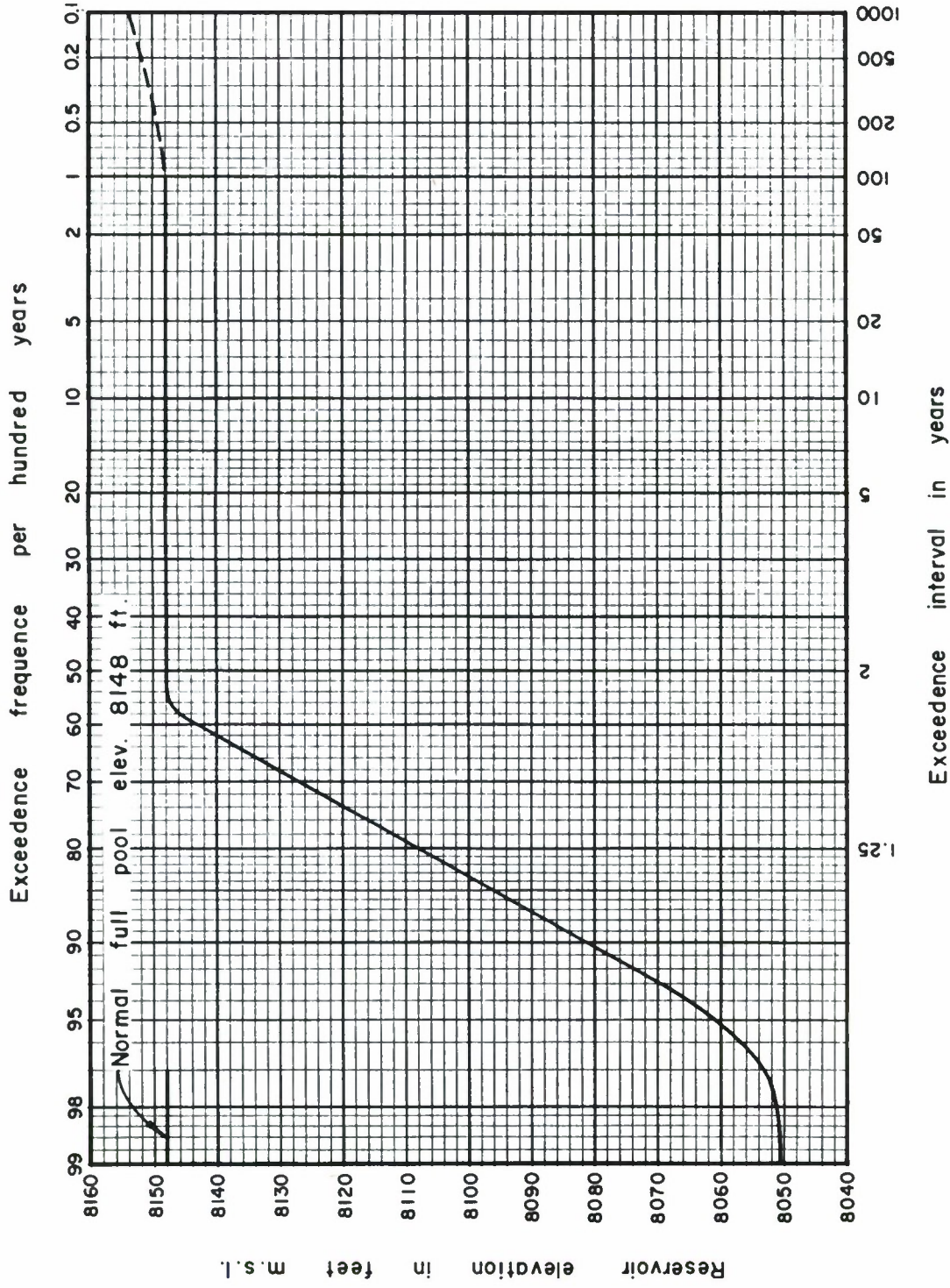
STAGE - DURATION CURVES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: D.D.D.

Date: SEPTEMBER 1971

Drawn: T.G.K.



NOTES:

1. Data based on U.S.B.R. hypothetical operations (1928-1956).
2. Extension of curve above normal full pool (elev. 8148 ft.) was estimated.

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

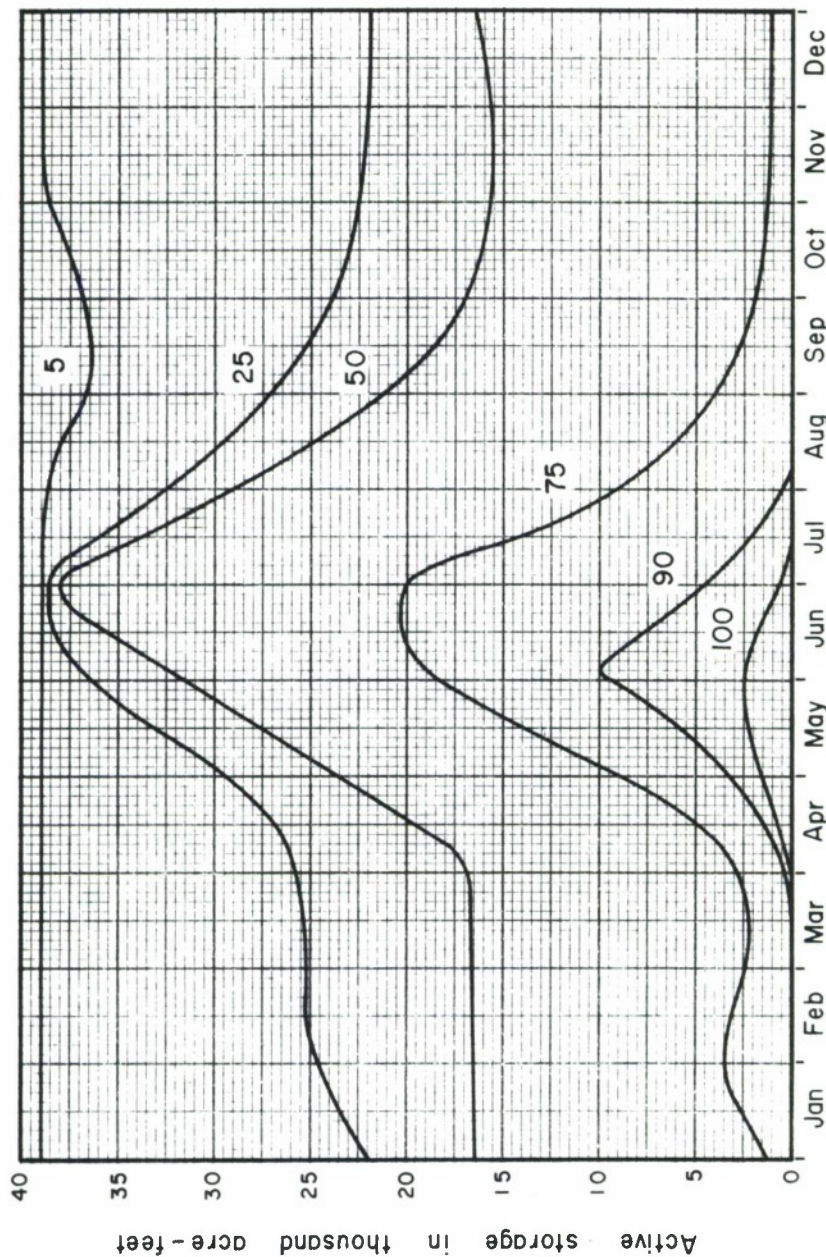
STAGE FREQUENCY CURVE

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.A.Z.

Drawn: T.G.K.

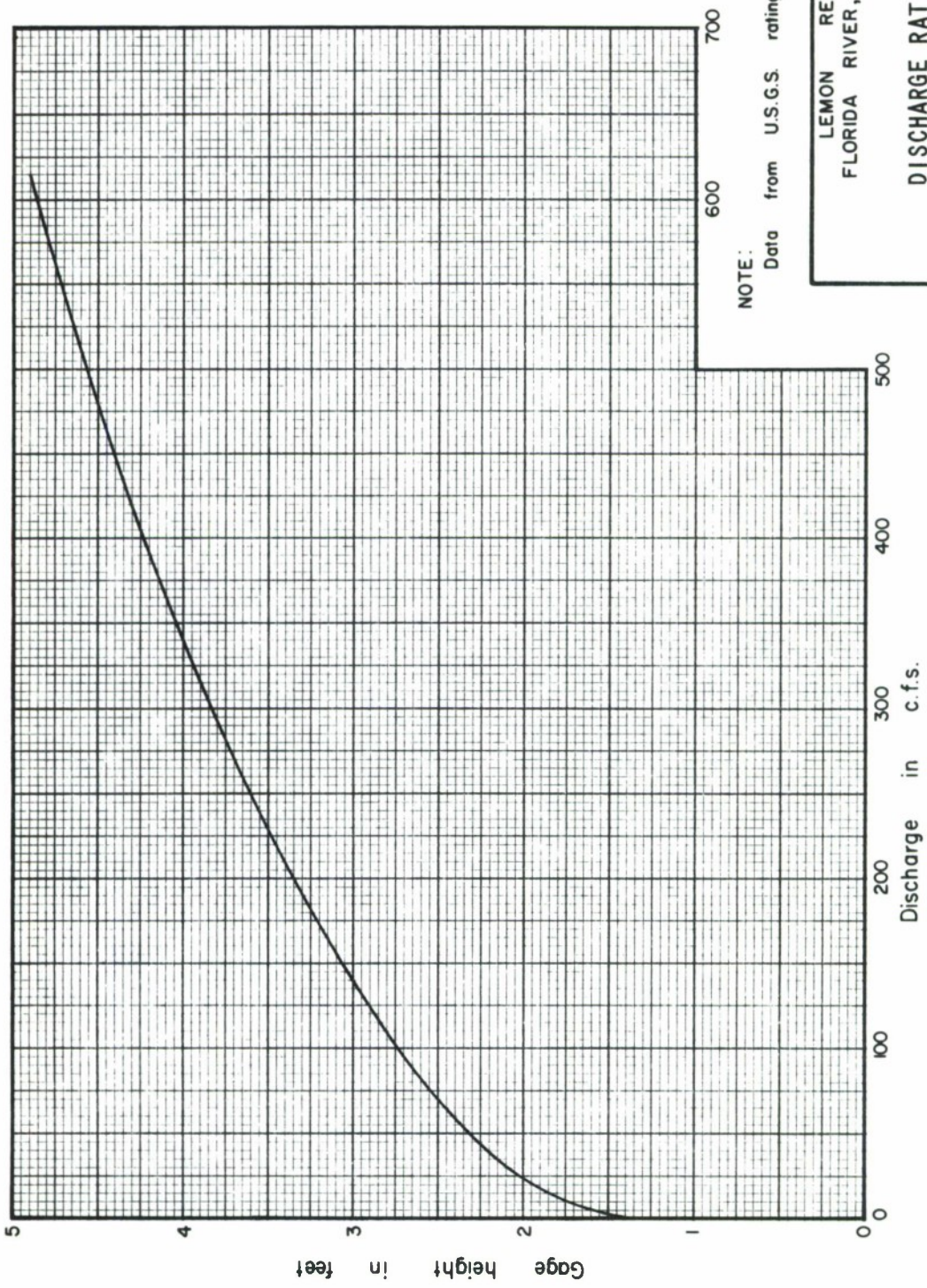
Date: SEPTEMBER 1971



NOTES:

1. Indicated parameter value is percent of years that storage is equalled or exceeded on given date. (Values are based on storage at end of month.)
2. Curves computed from data furnished by U.S. Bureau of Reclamation.

LEMON RESERVOIR FLORIDA RIVER, COLORADO	
SEASONAL VARIATION OF RESERVOIR STORAGE FREQUENCY	
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA	
Prepared: H.A.Z.	Date: SEPTEMBER 1971
Drawn: T.G.K.	



NOTE: Data from U.S.G.S. rating table No. 1

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

DISCHARGE RATING CURVE

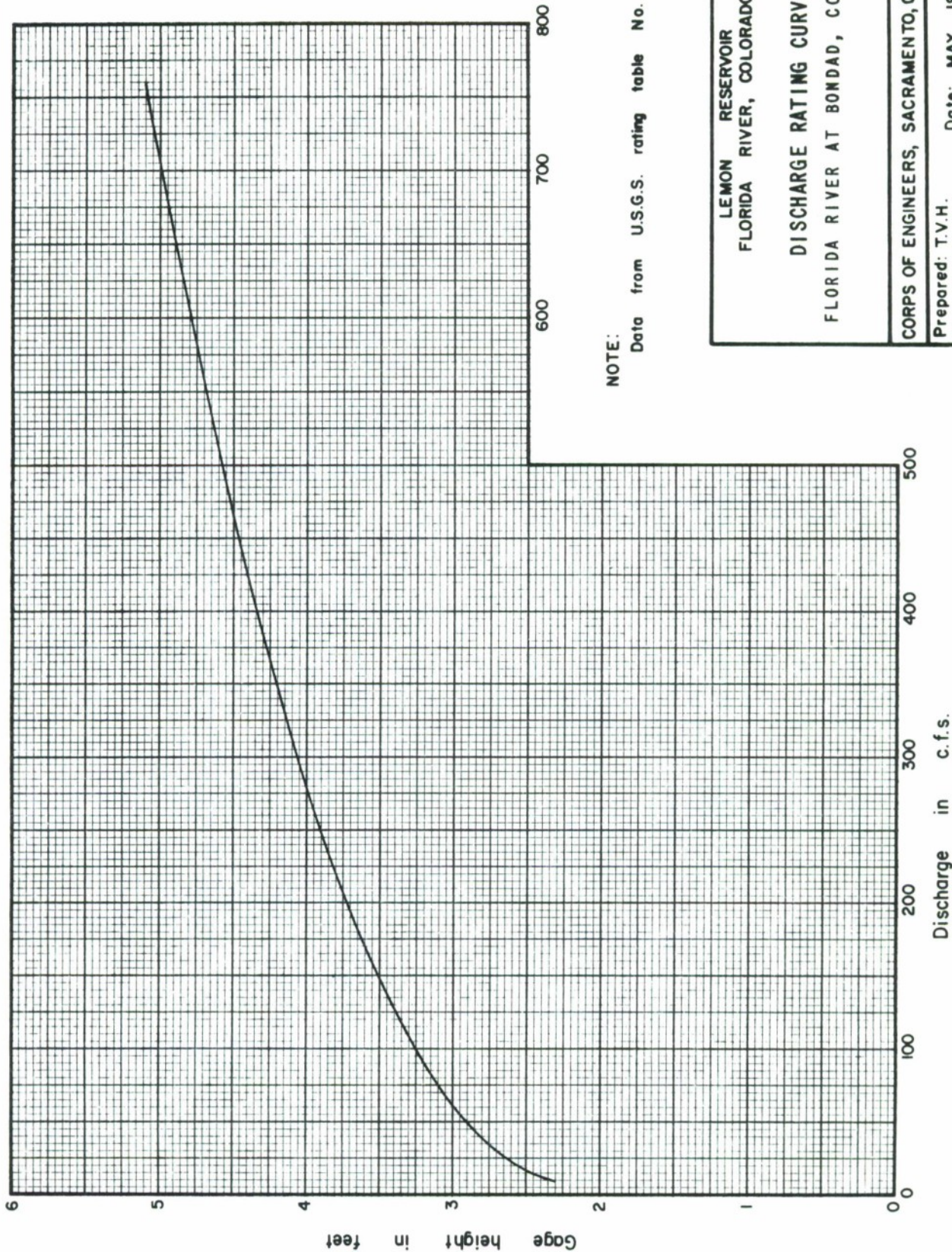
FLORIDA RIVER BELOW FLORIDA FARMERS
DITCH NEAR DURANGO, COLORADO

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H.

Date: MAY 1972

Drawn: T.G.K.



NOTE:

Data from U.S.G.S. rating table No. 6

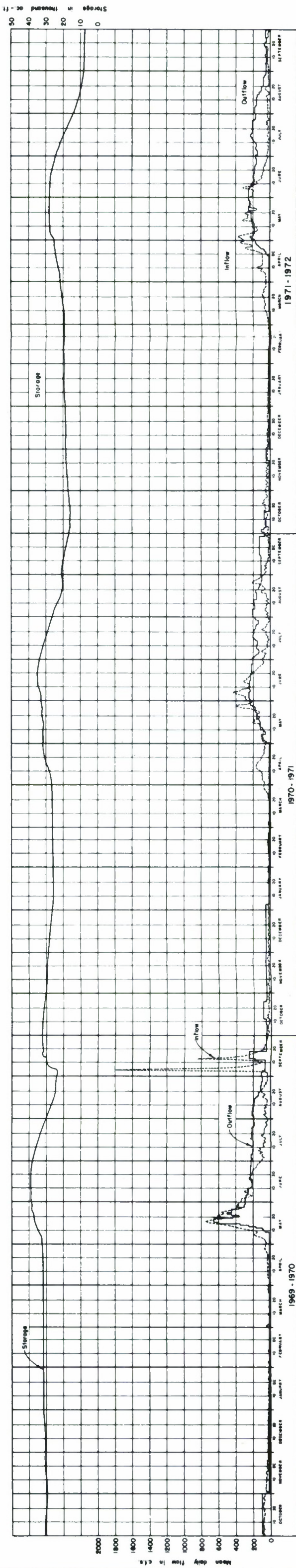
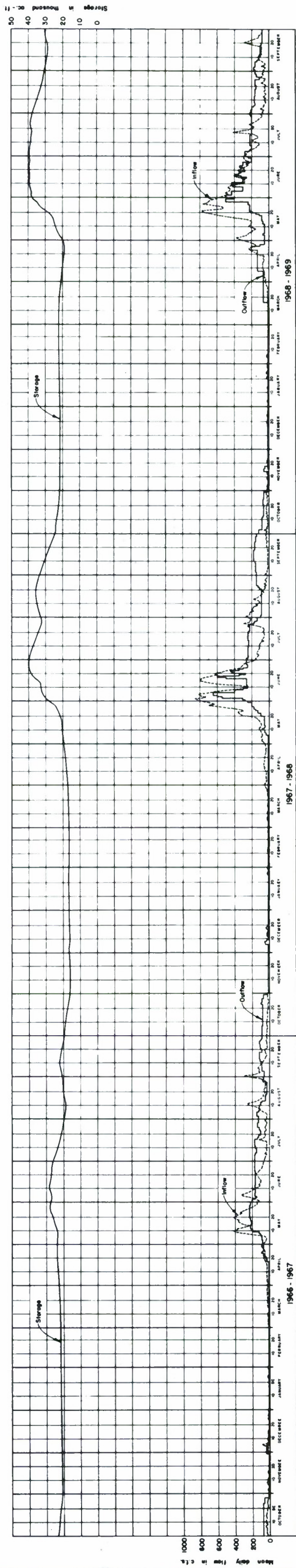
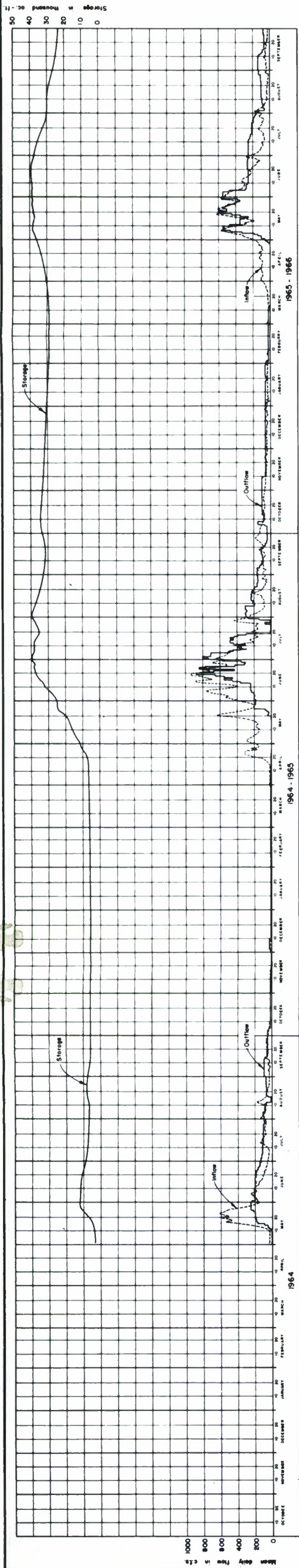
LEMON RESERVOIR
FLORIDA RIVER, COLORADO
DISCHARGE RATING CURVE
FLORIDA RIVER AT BONDAD, COLORADO

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

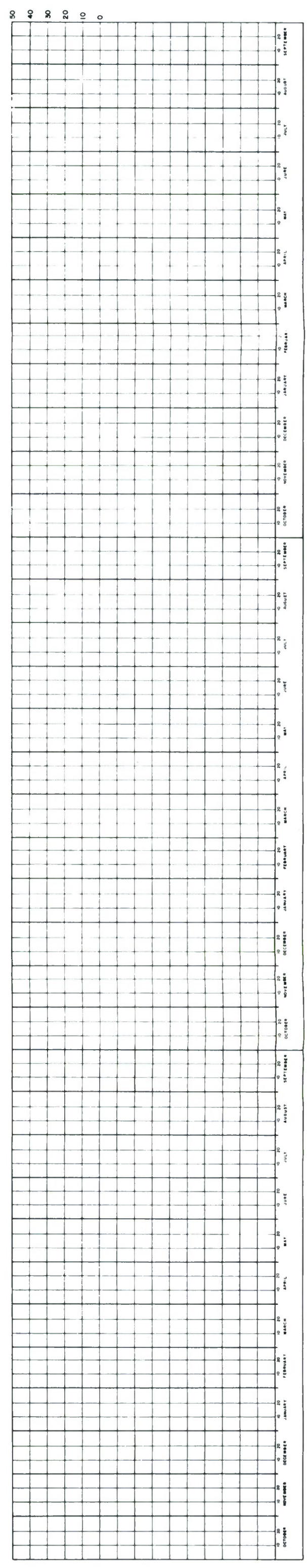
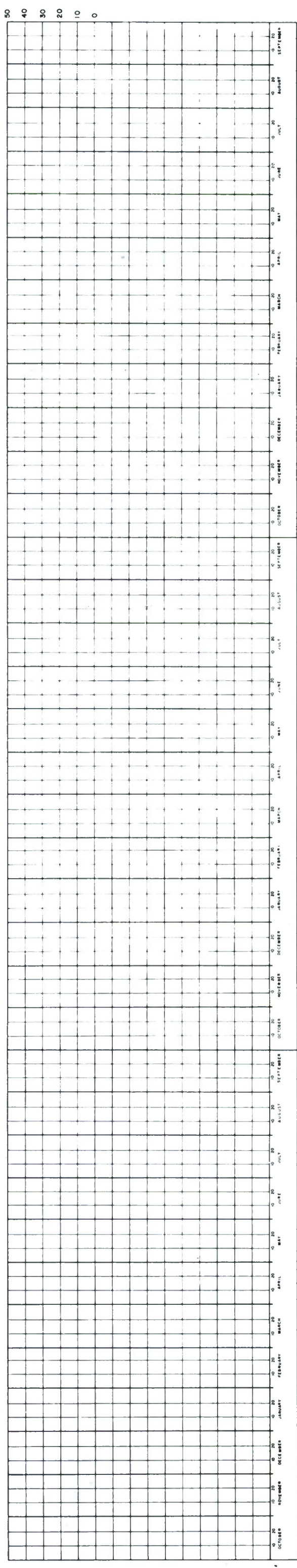
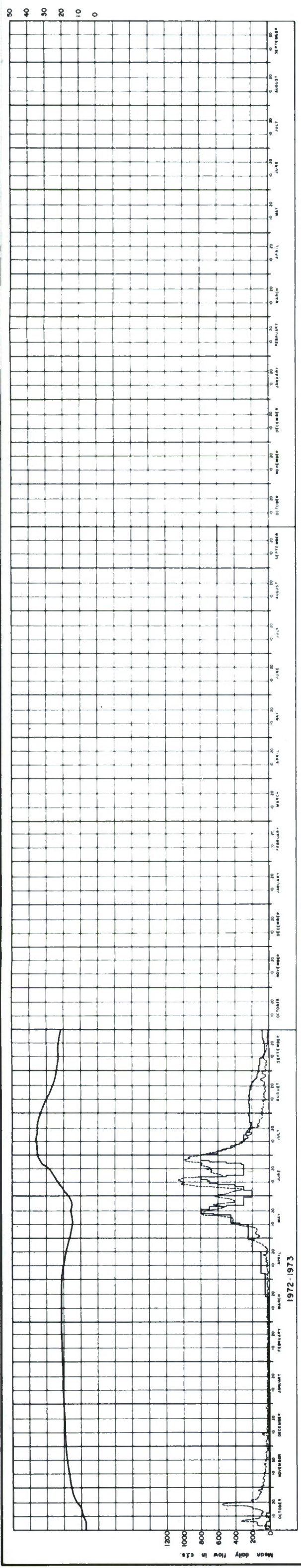
Prepared: T.V.H.

Date: MAY 1972

Drawn: T.G.K.



NOTE
Data furnished by U.S.R.



NOTE Data furnished by U S B R

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

REPORT ON RESERVOIR REGULATION
FOR FLOOD CONTROL

July 1974

APPENDIX A
STANDING INSTRUCTIONS TO DAMTENDERS
AND
FLOOD CONTROL REGULATIONS
FOR
LEMON DAM AND RESERVOIR

Department of the Army
Sacramento District, Corps of Engineers
Sacramento, California

PERSONNEL CONCERNED IN FLOOD-CONTROL OPERATION OF LEMON DAM AND RESERVOIR

UNIT		OFFICE PHONE	NAME	HOME PHONE
U.S. BUREAU OF RECLAMATION SALT LAKE CITY, UTAH	UPPER COLORADO REGION	801-524-5592 (Salt Lake City, Utah)	D. L. CRANDALL REGIONAL DIRECTOR	
	DIVISION OF RIVER CONTROL	801-524-5438 (Salt Lake City, Utah)	L. E. HOLMES CHIEF	801-295-7945 (Bountiful, Utah)
	RESERVOIR REGULATION UNIT	801-524-5571 (Salt Lake City, Utah)	D. H. BARNETT CHIEF	801-355-9500 (Salt Lake City, Utah)
LEMON DAM	PROJECT MANAGER	303-247-0247 (Durango, Col.)	ED K. WISCOMBE	303-247-4007 (Durango, Col.)
	SUPERINTENDENT	303-247-5332 (Durango, Col.)	SAM G. WALL	303-247-5332 (Durango, Col.)
DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	DISTRICT ENGINEER	916-449-2232*	COL. F. G. ROCKWELL, JR. DISTRICT ENGINEER	
	RESERVOIR REGULATION SECTION	916-449-2378* 916-449-3168* 916-449-3167*	R. P. LEATHAM CHIEF	916-483-2010
	HYDROLOGY SECTION	916-449-2517*	R. A. NEAL CHIEF	916-791-0478

FTS: SACRAMENTO 916-449-2000; SALT LAKE CITY 801-524-5500; DURANGO 303-837-0111

*NOTE: BETWEEN 4:30 PM AND 7:45 AM; OR ON SATURDAY, SUNDAY, OR HOLIDAYS
USE 916-452-1535 (FLOOD SEASON ONLY)

LEMON DAM AND RESERVOIR, FLORIDA RIVER, COLORADO

C.D.M.

REV. NOV 1973

APPENDIX A

STANDING INSTRUCTIONS TO DAMTENDERS AND FLOOD CONTROL REGULATIONS FOR LEMON DAM AND RESERVOIR FLORIDA RIVER, COLORADO

PART I - STANDING INSTRUCTIONS TO DAMTENDERS

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
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2.	Flood Operation Requirements	A-1
3.	Limitations on Storage	A-2
4.	Limitations on Releases	A-2
5.	Standing Instructions During Flood Emergency	A-2
6.	Operational Responsibilities	A-3
7.	Modification of Flood Control Regulations	A-4
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LIST OF CHARTS

A-1	Area and Capacity Curves
A-2	Area and Capacity Tables (6 pages)
A-3	Spillway Discharge Curve
A-4	Outlet Works Discharge Curves (2 sheets)
A-5	Discharge Rating Curves, Florida River (2 sheets)

PART II - FLOOD CONTROL REGULATIONS

Flood Control Regulations
Flood Control Diagram

REPORT ON RESERVOIR REGULATION
FOR FLOOD CONTROL

LEMON RESERVOIR
FLORIDA RIVER, COLORADO
APPENDIX A
STANDING INSTRUCTIONS TO DAMTENDERS
AND FLOOD CONTROL REGULATIONS

1. GENERAL

a. This appendix to the "Report on Reservoir Regulation for Flood Control, Lemon Reservoir, Florida River, Colorado" is prepared in accordance with instructions contained in EM 1110-2-3600, paragraph 4-07 (Standing Instructions to Damtenders) and pertains to duties and responsibilities of the damtender in connection with the functional operation of Lemon Dam and Reservoir for flood control, and the reporting of required hydrologic data.

b. Operational instructions to the damtender are briefly outlined with specific emphasis on the damtenders duties and responsibilities during extreme flood emergencies when communication facilities between him and his operating office may have been disrupted. It is designed for optional separation from the report and use as an emergency flood control regulation guide, or as published, in conjunction with the "Report on Reservoir Regulation for Flood Control." To facilitate independent use of this appendix, charts required for the emergency flood control operation of Lemon Reservoir are included herein. In some cases, a duplication of charts shown in the report is necessary.

2. FLOOD CONTROL OPERATION REQUIREMENTS

a. Lemon Reservoir will be operated for flood control in accordance with flood control regulations prescribed by the Secretary of the Army. A copy of the regulations and the flood control diagram are contained in this Appendix. The regulations, together with the flood control diagram, define the criteria for flood control operation of Lemon Reservoir.

b. The regulations provide that when water is stored within the flood control (joint-use) space, as determined from the flood control diagram, it will be released as rapidly as possible at rates not to exceed 1,000 cfs in Florida River downstream from the dam, insofar as possible. To that end, water stored in the flood control space as determined from the flood control diagram, will be released as rapidly as possible without causing flows in Florida River downstream from Lemon Dam to exceed the controlling flow rates given on the flood control diagram and in paragraph 4 below. Area and capacity curves are shown on chart A-1, and area and capacity tables are on chart A-2. The spillway discharge curve is presented on chart A-3.

c. The parameters on the flood control diagram are forecast inflow to the reservoir in thousand acre-feet between the given date and 31 July. Lemon Reservoir is operated to provide conditional storage space for control of forecasted snowmelt runoff. Authorized project objectives do not provide for reservation of space exclusively for control of rain floods. Space for rain floods is provided only to the extent it is incidentally available as a result of withdrawal of water for conservation purposes. Such incidental storage together with the surcharge is of considerable value in reducing rain flood peaks.

d. Whenever water is flowing over the uncontrolled spillway, releases through the outlet works should be reduced a compensating amount to keep flows from exceeding downstream channel capacities insofar as possible.

3. LIMITATIONS ON STORAGE

a. Operational limitations on storage in Lemon Reservoir are specified on the flood control diagram which accompanies the copy of regulations given in this Appendix. There are no legal limitations on storage in Lemon Reservoir since the property taking-line is above maximum operating level of the reservoir.

b. During the winter periods, the reservoir shall be held at or above elevation 8,023.0 feet to prevent the formation of ice about the intake structure.

4. LIMITATIONS ON RELEASES

a. Releases from Lemon Reservoir shall be restricted, insofar as possible, to quantities which will not cause flows in Florida River downstream from Lemon Dam to exceed 1,000 cfs. Releases shall not be changed more than 200 cfs in any 2-hour period.

b. To minimize cavitation, the high-pressure gates must not be operated for extended periods of time at a gate opening of less than 1 inch. When water is being released through the outlet works, the reservoir water surface must be kept at or above elevation 8,013.0 feet m.s.l. in order to avoid the formation of vortices and entrainment of air. Outlet works discharge curves are shown on chart A-4, and discharge rating curves for Florida River, downstream from the dam are shown on chart A-5.

5. STANDING INSTRUCTIONS DURING FLOOD EMERGENCY

a. The functional operation of Lemon Dam and Reservoir is under the direction of the Regional Director, Upper Colorado Region, U. S. Bureau of Reclamation. Instructions to U. S. Bureau of Reclamation personnel also are the responsibility of the Regional Director. The following are suggested instructions for emergency flood control operation of Lemon Dam and Reservoir. During flood periods close contact will be maintained between the damtender (or operating personnel) and the Regional Office.

b. If communication is broken between the operating personnel and the Regional Office during a flood emergency, the following procedure is recommended:

(1) Continue releases in accordance with the last instructions received from the Regional Office until communications are restored.

(2) If communications cannot be re-established and larger releases are required as determined from the flood control diagram, the outlet works should be operated in accordance with the diagram requirements.

(3) Make continuous effort to re-establish contact with the regional office or the project office.

6. OPERATIONAL RESPONSIBILITIES

Names and telephone numbers of key personnel involved in operation of the reservoir for flood control are included at the front of this Appendix. Responsibilities for flood control operation of Lemon Dam and Reservoir are as summarized herein:

a. The Regional Director, Bureau of Reclamation is responsible for:

(1) Developing and keeping current, snowmelt prediction procedures and preparing forecasts of snowmelt inflow into Lemon Reservoir to meet flood control operation requirements.

(2) Accomplishing the physical operation of the reservoir and associated facilities for flood control in accordance with the official regulations.

(3) Advising the District Engineer, Sacramento District, Corps of Engineers, of any need for emergency change in flood control operation.

(4) Reporting to the District Engineer, Sacramento District, Corps of Engineers, any unusual condition in the reservoir or along downstream channels which might temporarily interfere with the planned flood control operation of the reservoir.

(5) Keeping downstream interests advised of impending changes in flood control releases which may affect them.

(6) Reporting by telephone to the Reservoir Regulation Section, Sacramento District, Corps of Engineers, the data outlined in paragraph 8a in this Appendix, and other data that may be requested from time to time.

(7) Immediately after the end of each month, transmitting to the Reservoir Regulation Section of the Sacramento District, Corps of Engineers, the data specified in paragraph 8b in this Appendix.

b. The District Engineer, Sacramento District, Corps of Engineers, is responsible for:

(1) Preparing and submitting for publication in the Federal Register, the plan of regulation for flood control operation of Lemon Dam and Reservoir.

(2) Monitoring the regulation and being available for consultation during flood events.

(3) Approving or disapproving emergency changes in flood control operation recommended by the operating agency, or issuing instructions for such change on his own initiative.

(4) Advising the operating agency and the Chief of Engineers of any departure from the flood control regulations.

(5) Preparing monthly operation and other special reports relative to operation of the reservoir as required by the Office, Chief of Engineers.

7. MODIFICATION OF FLOOD CONTROL REGULATIONS

a. The District Engineer, Sacramento District, Corps of Engineers, may temporarily modify the flood control regulations for Lemon Dam and Reservoir, if necessary in time of emergency. Requests for, and action on, such modification may be made by any available means of communication to the Regional Director, Upper Colorado Region, U. S. Bureau of Reclamation, and the action taken by the District Engineer shall be confirmed in writing under date of same day to the office of the Regional Director of the Bureau of Reclamation.

b. The Regional Director of the Bureau of Reclamation may temporarily suspend application of the flood control regulations for Lemon Reservoir in the event this is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other severe hazards. Such action shall be immediately reported by any available means of communication and confirmed in writing under date of same day to the District Engineer, Corps of Engineers in charge of the locality. Revision of the flood control diagram for Lemon Dam and Reservoir, may be made when necessary with the mutual consent of the Corps of Engineers and the Bureau of Reclamation.

8. OPERATION REPORTS

a. The Bureau of Reclamation shall report by telephone to the Reservoir Regulation Section, Sacramento District, Corps of Engineers, each work day between 8:00 and 9:00 a.m. during flood periods, and at other times upon request, data as follows:

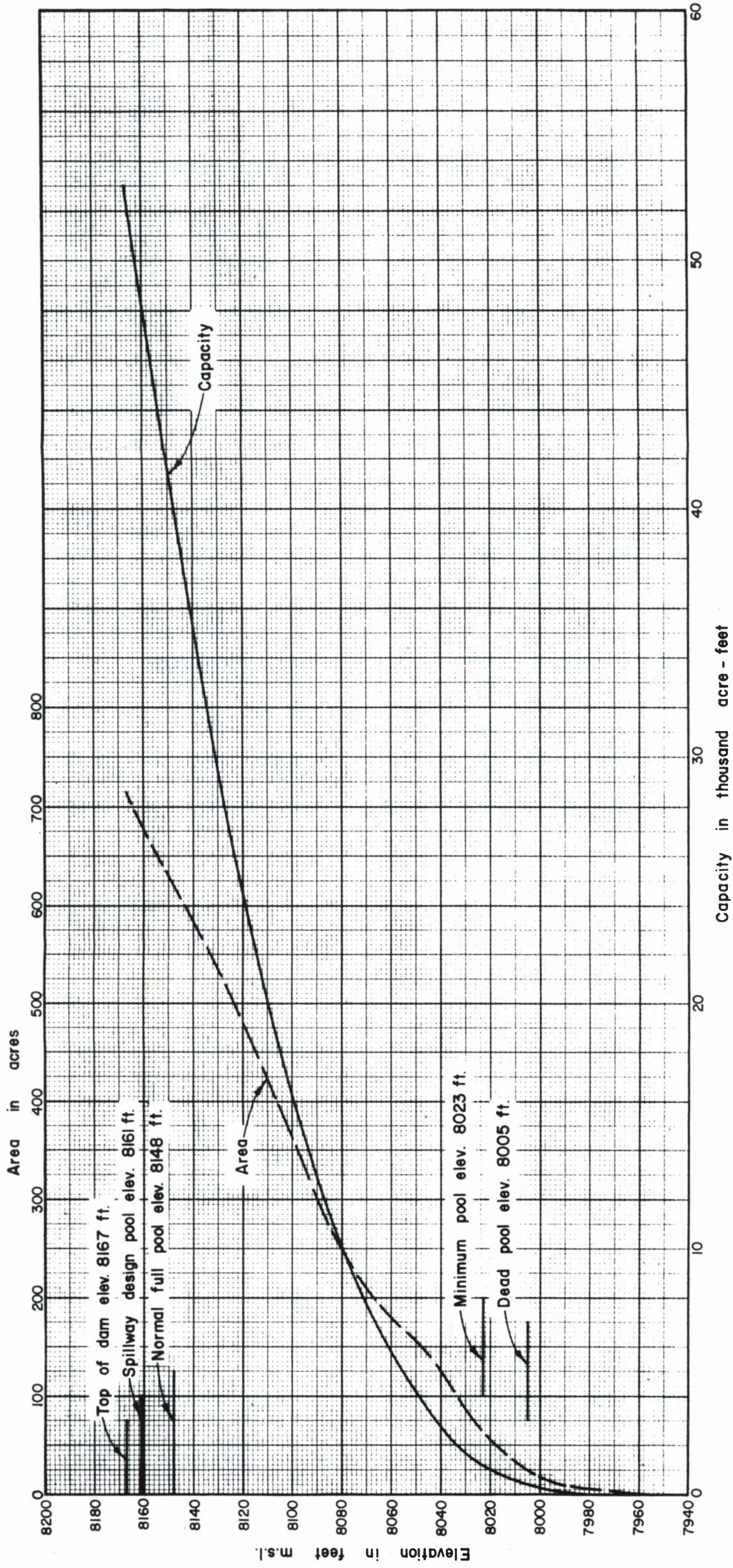
(1) The amount of flood control space required in Lemon Reservoir based on current forecasts of inflow.

(2) Elevation, storage, inflow, outflow, and anticipated outflow changes at the reservoir.

(3) Precipitation at the dam and at pertinent reporting stations in or adjacent to the drainage basin.

b. Immediately after the end of each month, the Bureau of Reclamation shall dispatch to the Reservoir Regulation Section, Sacramento District, Corps of Engineers, a summary of the following data:

- (1) Daily inflow, outflow, elevation, and storage at Lemon Reservoir.
- (2) Daily requirement of flood control space based on forecasts of inflow.
- (3) Inflow forecast amounts used for flood control operation.



LEMON RESERVOIR
FLORIDA RIVER, COLORADO

AREA AND CAPACITY CURVES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H.

Date: JUNE 1971

Draw: T.G.K.

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

AREA IN ACRES

NOV. 3, 1960

Elev. in Feet		1	2	3	4	5	6	7	8	9
7950							1	1	1	1
7960	1	1	1	2	2	2	2	2	3	3
7970	3	3	4	4	4	4	5	5	5	5
7980	6	6	6	6	7	7	7	7	8	8
7990	8	8	8	9	9	9	11	12	14	15
8000	17	19	21	23	25	27	28	30	31	33
8010	34	36	37	39	41	43	45	47	50	52
8020	54	57	59	62	65	68	71	75	79	83
8030	87	91	95	99	103	107	111	114	118	121
8040	124	127	130	133	135	138	142	145	148	151
8050	154	157	159	162	164	166	169	171	174	176
8060	179	182	184	187	189	192	195	198	201	204
8070	208	212	217	222	227	233	237	241	245	249
8080	253	257	262	267	272	277	281	286	290	295
8090	301	307	313	320	327	335	342	348	354	360
8100	366	372	377	382	387	392	398	404	410	416
8110	422	428	434	440	447	453	460	467	473	480
8120	486	492	498	504	510	516	521	527	532	536
8130	541	545	550	554	558	562	566	570	574	578
8140	583	588	592	597	603	608	613	617	622	627
8150	632	637	642	648	653	659	663	667	672	676
8160	681	686	691	696	701	706	711	716	721	726
8170	731									

CAPACITY IN ACRE FEET

Elev. in Feet		1	2	3	4	5	6	7	8	9
7950							1	1	2	3
7960	4	5	7	8	10	12	14	16	19	21
7970	24	28	31	35	39	43	48	52	58	63
7980	68	74	80	87	93	100	107	114	122	129
7990	137	145	154	162	171	180	190	201	214	229
8000	245	263	283	305	328	354	382	411	442	473
8010	507	542	578	617	657	699	743	789	838	888
8020	941	997	1055	1116	1179	1245	1315	1388	1466	1547
8030	1632	1720	1813	1910	2011	2116	2225	2337	2453	2572
8040	2695	2820	2949	3080	3214	3351	3491	3634	3781	3930
8050	4083	4238	4396	4557	4719	4884	5052	5222	5394	5569
8060	5747	5927	6110	6296	6484	6674	6868	7064	7263	7465
8070	7671	7881	8096	8315	8539	8769	9004	9243	9485	9732
8080	9983	10238	10498	10762	11032	11306	11585	11868	12156	12449
8090	12747	13051	13361	13678	14001	14333	14671	15016	15367	15724
8100	16087	16456	16830	17210	17595	17984	18379	18780	19187	19600
8110	20019	20444	20875	21312	21756	22206	22662	23126	23595	24072
8120	24555	25044	25539	26041	26548	27061	27580	28104	28633	29167
8130	29705	30249	30796	31348	31904	32464	33028	33596	34168	34744
8140	35325	35911	36501	37096	37696	38301	38911	39526	40146	40770
8150	41400	42034	42674	43319	43970	44626	45287	45952	46622	47296
8160	47975	48658	49346	50039	50738	51441	52151	52864	53583	54306
8170	55035									

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
7955										1
7956	1	1	1	1	1	1	1	1	1	1
7957	1	1	1	2	2	2	2	2	2	2
7958	2	2	2	2	2	3	3	3	3	3
7959	3	3	3	3	3	4	4	4	4	4
7960	4	4	4	4	5	5	5	5	5	5
7961	5	5	6	6	6	6	6	6	6	6
7962	7	7	7	7	7	7	7	8	8	8
7963	8	8	8	9	9	9	9	9	9	10
7964	10	10	10	10	11	11	11	11	11	12
7965	12	12	12	12	13	13	13	13	13	14
7966	14	14	14	15	15	15	15	15	16	16
7967	16	16	17	17	17	17	18	18	18	18
7968	19	19	19	19	20	20	20	21	21	21
7969	21	22	22	22	23	23	23	24	24	24
7970	24	25	25	25	26	26	26	27	27	27
7971	28	28	28	29	29	29	30	30	30	31
7972	31	32	32	32	33	33	33	34	34	34
7973	35	35	36	36	36	37	37	38	38	38
7974	39	39	40	40	41	41	41	42	42	43
7975	43	44	44	44	45	45	46	46	47	47
7976	48	48	49	49	50	50	51	51	51	52
7977	52	53	53	54	54	55	55	56	57	57
7978	58	58	59	59	60	60	61	61	62	62
7979	63	63	64	65	65	66	66	67	67	68
7980	68	69	70	70	71	71	72	72	73	74
7981	74	75	75	76	77	77	78	78	79	80
7982	80	81	82	82	83	83	84	85	85	86
7983	87	87	88	89	89	90	91	91	92	93
7984	93	94	95	95	96	97	97	98	99	99
7985	100	101	101	102	103	103	104	105	106	106
7986	107	108	108	109	110	111	111	112	113	113
7987	114	115	116	116	117	118	119	119	120	121
7988	122	122	123	124	125	126	126	127	128	129
7989	129	130	131	132	133	133	134	135	136	137
7990	137	138	139	140	141	141	142	143	144	145
7991	145	146	147	148	149	150	150	151	152	153
7992	154	155	155	156	157	158	159	160	161	162
7993	162	163	164	165	166	167	168	169	169	170
7994	171	172	173	174	175	176	177	177	178	179
7995	180	181	182	183	184	185	186	187	188	189
7996	190	191	192	193	194	195	197	198	199	200
7997	201	202	204	205	206	208	209	210	211	213
7998	214	216	217	218	220	221	223	224	226	227
7999	229	230	232	233	235	237	238	240	241	243

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8000	245	247	248	250	252	254	255	257	259	261
8001	263	265	267	269	271	273	275	277	279	281
8002	283	285	287	289	291	293	296	298	300	302
8003	305	307	309	312	314	316	319	321	324	326
8004	328	331	334	336	339	341	344	346	349	352
8005	354	357	360	363	365	368	371	374	377	379
8006	382	385	388	391	394	397	399	402	405	408
8007	411	414	417	420	423	426	429	432	435	438
8008	442	445	448	451	454	457	461	464	467	470
8009	473	477	480	483	487	490	493	497	500	503
8010	507	510	514	517	520	524	527	531	535	538
8011	542	545	549	552	556	560	563	567	571	574
8012	578	582	586	590	593	597	601	605	609	613
8013	617	620	624	628	632	636	640	644	649	653
8014	657	661	665	669	673	678	682	686	690	695
8015	699	703	707	712	716	721	725	729	734	738
8016	743	747	752	757	761	766	770	775	780	784
8017	789	794	799	803	808	813	818	823	828	833
8018	838	843	848	853	858	863	868	873	878	883
8019	888	894	899	904	909	915	920	925	931	936
8020	941	947	952	958	963	969	974	980	986	991
8021	997	1003	1008	1014	1020	1026	1032	1037	1043	1049
8022	1055	1061	1067	1073	1079	1085	1091	1097	1103	1110
8023	1116	1122	1128	1135	1141	1147	1154	1160	1166	1173
8024	1179	1186	1192	1199	1205	1212	1219	1225	1232	1239
8025	1245	1252	1259	1266	1273	1280	1287	1294	1301	1308
8026	1315	1322	1329	1337	1344	1351	1359	1366	1373	1381
8027	1388	1396	1404	1411	1419	1427	1434	1442	1450	1458
8028	1466	1474	1482	1490	1498	1506	1514	1522	1530	1538
8029	1547	1555	1563	1572	1580	1589	1597	1606	1614	1623
8030	1632	1640	1649	1658	1667	1676	1684	1693	1702	1711
8031	1720	1730	1739	1748	1757	1766	1776	1785	1794	1804
8032	1813	1823	1832	1842	1852	1861	1871	1881	1890	1900
8033	1910	1920	1930	1940	1950	1960	1970	1980	1991	2001
8034	2011	2021	2032	2042	2053	2063	2074	2084	2095	2105
8035	2116	2127	2137	2148	2159	2170	2181	2192	2203	2214
8036	2225	2236	2247	2258	2269	2281	2292	2303	2315	2326
8037	2337	2349	2360	2372	2383	2395	2406	2418	2430	2441
8038	2453	2465	2477	2489	2501	2512	2524	2536	2548	2560
8039	2572	2585	2597	2609	2621	2633	2646	2658	2670	2683
8040	2695	2707	2720	2732	2745	2757	2770	2782	2795	2808
8041	2820	2833	2846	2859	2871	2884	2897	2910	2923	2936
8042	2949	2962	2975	2988	3001	3014	3027	3041	3054	3067
8043	3080	3094	3107	3120	3134	3147	3160	3174	3187	3201
8044	3214	3228	3241	3255	3269	3282	3296	3310	3323	3337

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8045	3351	3365	3379	3393	3406	3420	3434	3448	3463	3477
8046	3491	3505	3519	3533	3548	3562	3576	3591	3605	3620
8047	3634	3649	3663	3678	3692	3707	3722	3736	3751	3766
8048	3781	3796	3810	3825	3840	3855	3870	3885	3900	3915
8049	3930	3945	3961	3976	3991	4006	4022	4037	4052	4068
8050	4083	4098	4114	4129	4145	4160	4176	4191	4207	4223
8051	4238	4254	4270	4285	4301	4317	4333	4349	4364	4380
8052	4396	4412	4428	4444	4460	4476	4492	4508	4524	4541
8053	4557	4573	4589	4605	4622	4638	4654	4670	4687	4703
8054	4719	4736	4752	4769	4785	4802	4818	4835	4851	4868
8055	4884	4901	4918	4934	4951	4968	4984	5001	5018	5035
8056	5052	5069	5085	5102	5119	5136	5153	5170	5187	5204
8057	5222	5239	5256	5273	5290	5307	5325	5342	5359	5377
8058	5394	5411	5429	5446	5464	5481	5499	5516	5534	5552
8059	5569	5587	5604	5622	5640	5658	5675	5693	5711	5729
8060	5747	5765	5783	5801	5819	5837	5855	5873	5891	5909
8061	5927	5945	5964	5982	6000	6018	6037	6055	6073	6092
8062	6110	6128	6147	6165	6184	6202	6221	6240	6258	6277
8063	6296	6314	6333	6352	6370	6389	6408	6427	6446	6465
8064	6484	6503	6522	6541	6560	6579	6598	6617	6636	6655
8065	6674	6694	6713	6732	6751	6771	6790	6809	6829	6848
8066	6868	6887	6907	6926	6946	6965	6985	7005	7024	7044
8067	7064	7083	7103	7123	7143	7163	7183	7203	7223	7243
8068	7263	7283	7303	7323	7343	7364	7384	7404	7424	7445
8069	7465	7486	7506	7527	7547	7568	7588	7609	7630	7651
8070	7671	7692	7713	7734	7755	7776	7797	7818	7839	7860
8071	7881	7903	7924	7945	7967	7988	8009	8031	8053	8074
8072	8096	8117	8139	8161	8183	8205	8227	8249	8271	8293
8073	8315	8337	8359	8382	8404	8426	8449	8471	8494	8517
8074	8539	8562	8585	8608	8631	8654	8677	8700	8723	8746
8075	8769	8793	8816	8839	8863	8886	8910	8933	8957	8980
8076	9004	9028	9052	9075	9099	9123	9147	9171	9195	9219
8077	9243	9267	9291	9315	9339	9364	9388	9412	9436	9461
8078	9485	9510	9534	9559	9583	9608	9633	9657	9682	9707
8079	9732	9757	9782	9807	9832	9857	9882	9907	9932	9957
8080	9983	10008	10033	10059	10084	10110	10135	10161	10187	10212
8081	10238	10264	10290	10315	10341	10367	10393	10419	10445	10472
8082	10498	10524	10550	10577	10603	10629	10656	10682	10709	10736
8083	10762	10789	10816	10842	10869	10896	10923	10950	10977	11004
8084	11032	11059	11086	11113	11141	11168	11196	11223	11251	11278
8085	11306	11334	11361	11389	11417	11445	11473	11501	11529	11557
8086	11585	11613	11641	11670	11698	11726	11754	11783	11811	11840
8087	11868	11897	11926	11954	11983	12012	12041	12069	12098	12127
8088	12156	12185	12214	12244	12273	12302	12331	12361	12390	12420
8089	12449	12479	12508	12538	12568	12598	12627	12657	12687	12717

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8090	12747	12778	12808	12838	12868	12899	12929	12960	12990	13021
8091	13051	13082	13113	13144	13175	13206	13237	13268	13299	13330
8092	13361	13393	13424	13456	13487	13519	13550	13582	13614	13646
8093	13678	13710	13742	13774	13806	13839	13871	13904	13936	13969
8094	14001	14034	14067	14100	14133	14166	14199	14232	14266	14299
8095	14333	14366	14400	14433	14467	14501	14535	14569	14603	14637
8096	14671	14705	14739	14774	14808	14843	14877	14912	14946	14981
8097	15016	15051	15086	15121	15156	15191	15226	15261	15296	15332
8098	15367	15402	15438	15474	15509	15545	15581	15616	15652	15688
8099	15724	15760	15796	15833	15869	15905	15941	15978	16014	16051
8100	16087	16124	16161	16197	16234	16271	16308	16345	16382	16419
8101	16456	16493	16531	16568	16605	16643	16680	16718	16755	16793
8102	16830	16868	16906	16944	16982	17020	17058	17096	17134	17172
8103	17210	17248	17287	17325	17363	17402	17440	17479	17517	17556
8104	17595	17633	17672	17711	17750	17789	17828	17867	17906	17945
8105	17984	18023	18063	18102	18142	18181	18221	18260	18300	18339
8106	18379	18419	18459	18499	18539	18579	18619	18659	18699	18740
8107	18780	18821	18861	18902	18942	18983	19024	19064	19105	19146
8108	19187	19228	19269	19310	19351	19393	19434	19475	19517	19558
8109	19600	19642	19683	19725	19767	19809	19851	19893	19935	19977
8110	20019	20061	20103	20146	20188	20231	20273	20316	20358	20401
8111	20444	20487	20530	20573	20616	20659	20702	20745	20788	20832
8112	20875	20919	20962	21006	21049	21093	21137	21181	21224	21268
8113	21312	21357	21401	21445	21489	21533	21578	21622	21667	21711
8114	21756	21801	21846	21890	21935	21980	22025	22070	22115	22161
8115	22206	22251	22297	22342	22388	22433	22479	22525	22571	22616
8116	22662	22708	22754	22801	22847	22893	22939	22986	23032	23079
8117	23126	23172	23219	23266	23313	23360	23407	23454	23501	23548
8118	23595	23643	23690	23738	23785	23833	23881	23928	23976	24024
8119	24072	24120	24168	24216	24264	24313	24361	24409	24458	24506
8120	24555	24603	24652	24701	24750	24799	24847	24896	24946	24995
8121	25044	25093	25142	25192	25241	25291	25340	25390	25440	25489
8122	25539	25589	25639	25689	25739	25789	25839	25889	25940	25990
8123	26041	26091	26141	26192	26243	26293	26344	26395	26446	26497
8124	26548	26599	26650	26701	26752	26804	26855	26906	26958	27009
8125	27061	27113	27164	27216	27268	27320	27371	27423	27475	27528
8126	27580	27632	27684	27736	27789	27841	27893	27946	27998	28051
8127	28104	28156	28209	28262	28315	28367	28420	28473	28526	28579
8128	28633	28686	28739	28792	28846	28899	28952	29006	29059	29113
8129	29167	29220	29274	29328	29381	29435	29489	29543	29597	29651
8130	29705	29759	29814	29868	29922	29976	30031	30085	30140	30194
8131	30249	30303	30358	30412	30467	30522	30577	30631	30686	30741
8132	30796	30851	30906	30961	31016	31072	31127	31182	31237	31293
8133	31348	31404	31459	31515	31570	31626	31681	31737	31793	31848
8134	31904	31960	32016	32072	32128	32184	32240	32296	32352	32408

FLORIDA PROJECT - COLORADO LEMON RESERVOIR

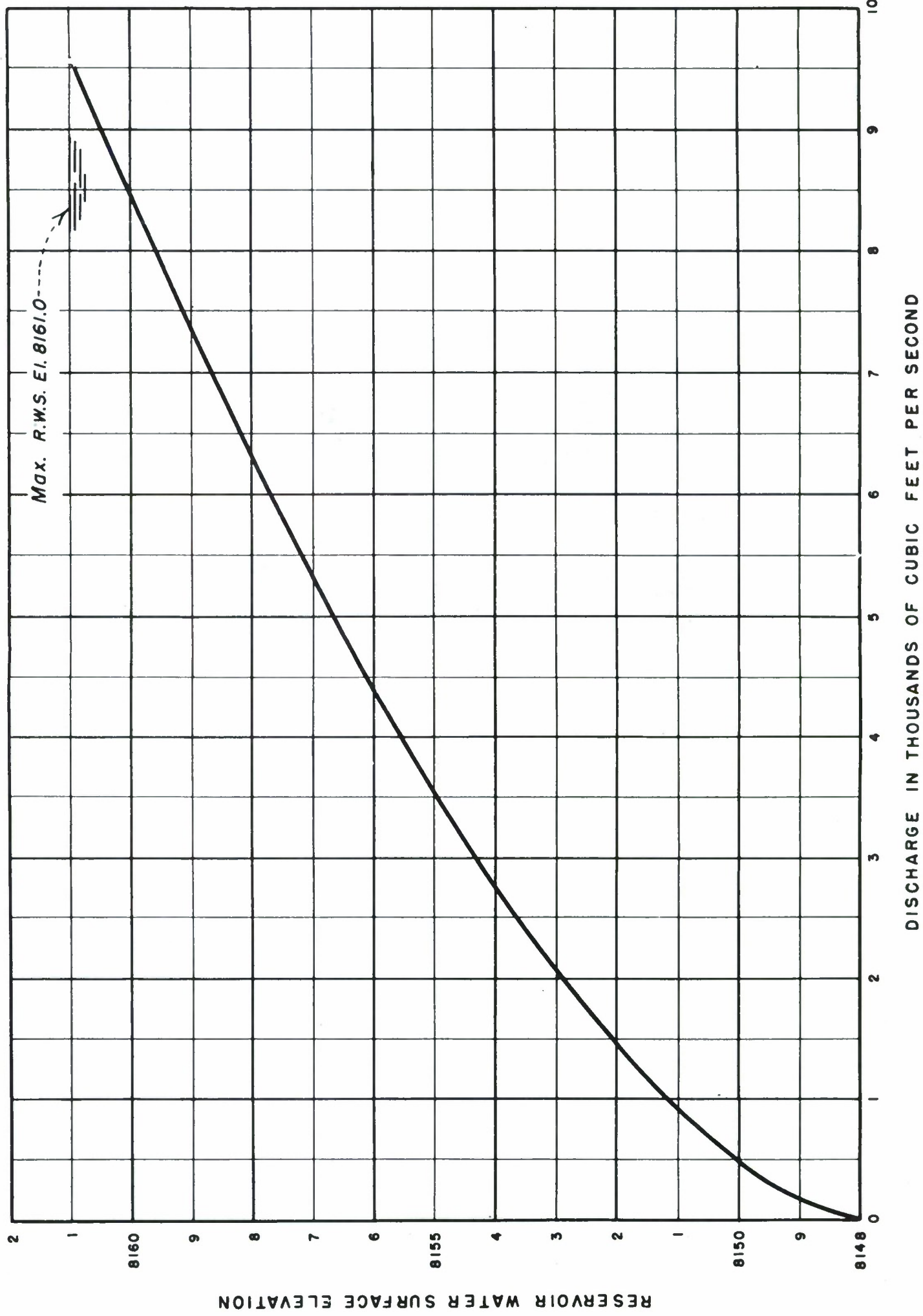
CAPACITY IN ACRE FEET

NOV. 3, 1960

Elev. in Feet	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
8135	32464	32520	32577	32633	32689	32746	32802	32859	32915	32972
8136	33028	33085	33141	33198	33255	33312	33368	33425	33482	33539
8137	33596	33653	33710	33767	33824	33882	33939	33996	34053	34111
8138	34168	34226	34283	34341	34398	34456	34513	34571	34629	34687
8139	34744	34802	34860	34918	34976	35034	35092	35151	35209	35267
8140	35325	35384	35442	35500	35559	35617	35676	35734	35793	35852
8141	35911	35969	36028	36087	36146	36205	36264	36323	36382	36441
8142	36501	36560	36619	36679	36738	36797	36857	36917	36976	37036
8143	37096	37155	37215	37275	37335	37395	37455	37515	37575	37635
8144	37696	37756	37816	37877	37937	37998	38058	38119	38179	38240
8145	38301	38362	38423	38484	38544	38605	38667	38728	38789	38850
8146	38911	38972	39034	39095	39157	39218	39280	39341	39403	39464
8147	39526	39588	39650	39712	39773	39835	39897	39959	40021	40084
8148	40146	40208	40270	40333	40395	40457	40520	40582	40645	40708
8149	40770	40833	40896	40959	41021	41084	41147	41210	41273	41337
8150	41400	41463	41526	41590	41653	41716	41780	41843	41907	41971
8151	42034	42098	42162	42226	42290	42354	42418	42482	42546	42610
8152	42674	42738	42803	42867	42931	42996	43060	43125	43190	43254
8153	43319	43384	43449	43514	43579	43644	43709	43774	43839	43904
8154	43970	44035	44101	44166	44232	44297	44363	44428	44494	44560
8155	44626	44692	44758	44824	44890	44956	45022	45088	45154	45221
8156	45287	45353	45420	45486	45553	45619	45686	45752	45819	45886
8157	45952	46019	46086	46153	46220	46287	46354	46421	46488	46555
8158	46622	46689	46756	46824	46891	46958	47026	47093	47161	47228
8159	47296	47364	47431	47499	47567	47635	47703	47771	47839	47907
8160	47975	48043	48111	48179	48248	48316	48384	48453	48521	48590
8161	48658	48727	48795	48864	48933	49002	49070	49139	49208	49277
8162	49346	49415	49485	49554	49623	49692	49762	49831	49900	49970
8163	50039	50109	50179	50248	50318	50388	50458	50528	50598	50668
8164	50738	50808	50878	50948	51018	51089	51159	51229	51300	51370
8165	51441	51513	51584	51654	51725	51796	51867	51938	52009	52080
8166	52151	52222	52293	52364	52436	52507	52578	52650	52721	52793
8167	52864	52936	53008	53079	53151	53223	53295	53367	53439	53511
8168	53583	53655	53727	53799	53872	53944	54016	54089	54161	54234
8169	54306	54379	54452	54524	54597	54670	54743	54816	54889	54962
8170	55035									

NOTES:

1. Table was furnished by the U.S. Bureau of Reclamation, Region 4.
2. Minimum pool elevation 8023 ft.
3. Normal full pool elevation 8148 ft.
4. Top of dam elevation 8167 ft.



NOTE

Any variation in discharge from this curve as determined by measurements of flow downstream from the spillway should be reported to the Chief Engineer.

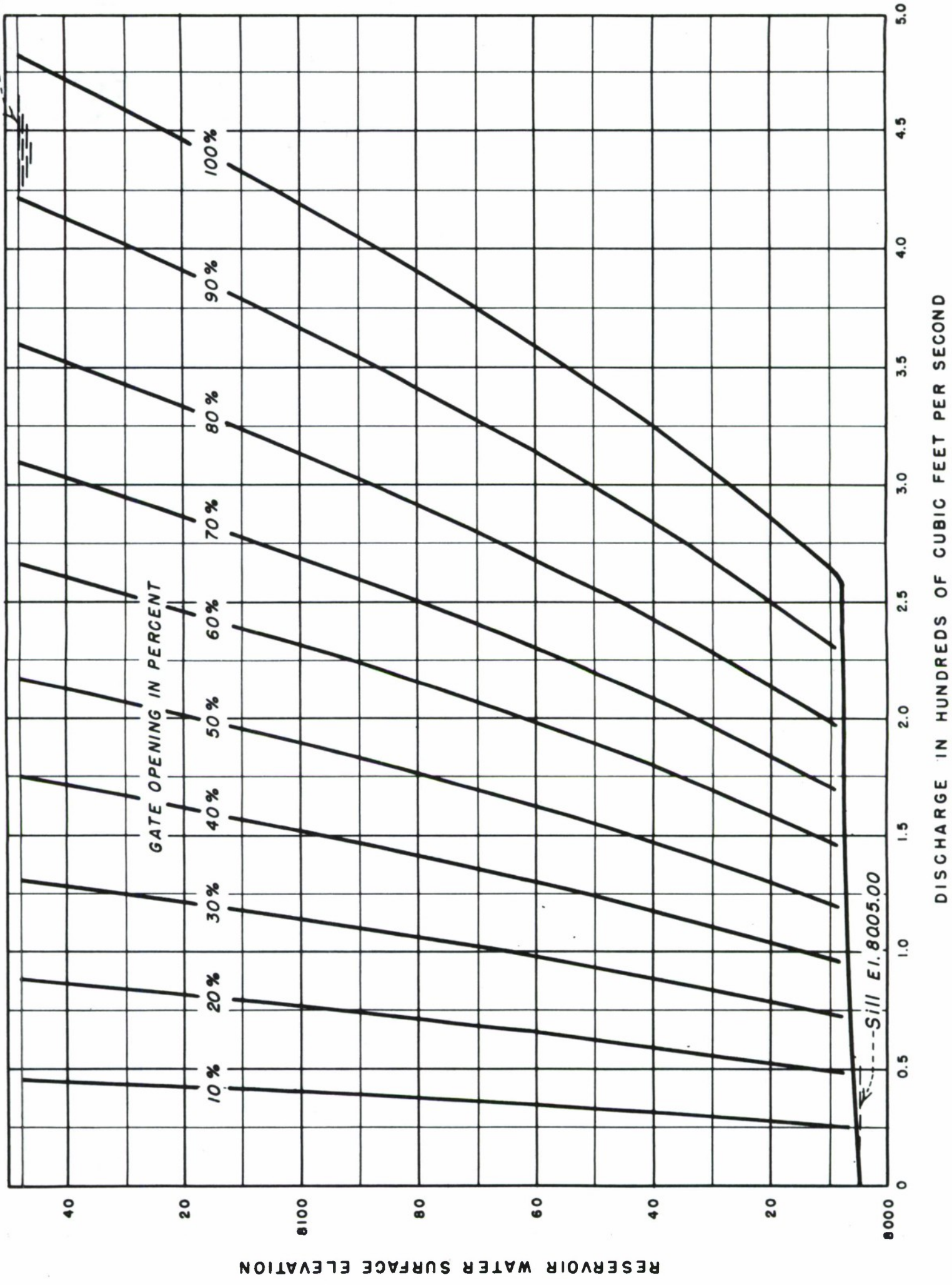
 ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT-COLORADO

LEMON DAM SPILLWAY DISCHARGE CURVE

DRAWN--G.O.Z.--SUBMITTED *[Signature]*
TRACED--R.B.S.--RECOMMENDED *[Signature]*
CHECKED--R.H.R.--APPROVED--*[Signature]*
DENVER, COLORADO, APRIL 11, 1963 519-D-198

Normal R.W.S. El. 8148.0



NOTES

Any variation in discharge from those shown as determined by measurements of flow downstream from the outlet works should be reported to the Chief Engineer.

Discharges shown on the drawing are the discharges through one 2'-3" x 2'-3" H.P. gate at the gate chamber.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

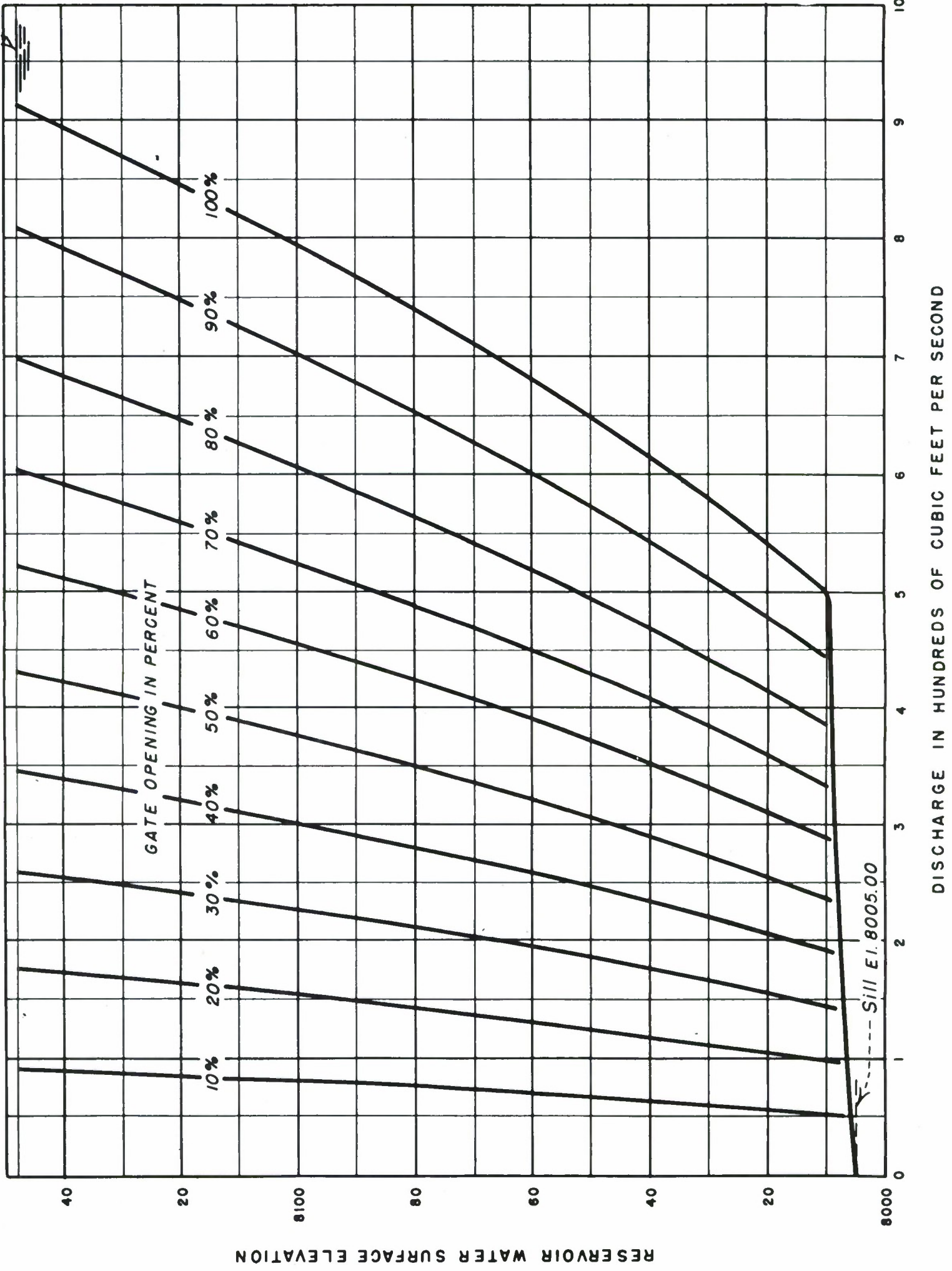
LEMON DAM
OUTLET WORKS

DISCHARGE CURVES FOR ONE 2'-3"x2'-3" H.P. GATE

DRAWN - G.S.Z. - SUBMITTED *Paul D. Hall*
TRACED - R.B.S. - RECOMMENDED *R. J. Lamm*
CHECKED - *R.H.R.* - APPROVED - *R. J. Lamm*
DENVER, COLORADO, APRIL 18/1963 CHIEF DAMS BRANCH

519-D-200

Normal R.W.S. El. 8148.0



NOTES

Any variation in discharge from those shown as determined by measurements of flow downstream from the outlet works should be reported to the Chief Engineer. Discharges shown on the drawing are the discharges through two 2'-3" x 2'-3" H.P. gates at the gate chamber.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
FLORIDA PROJECT - COLORADO

LEMON DAM

OUTLET WORKS

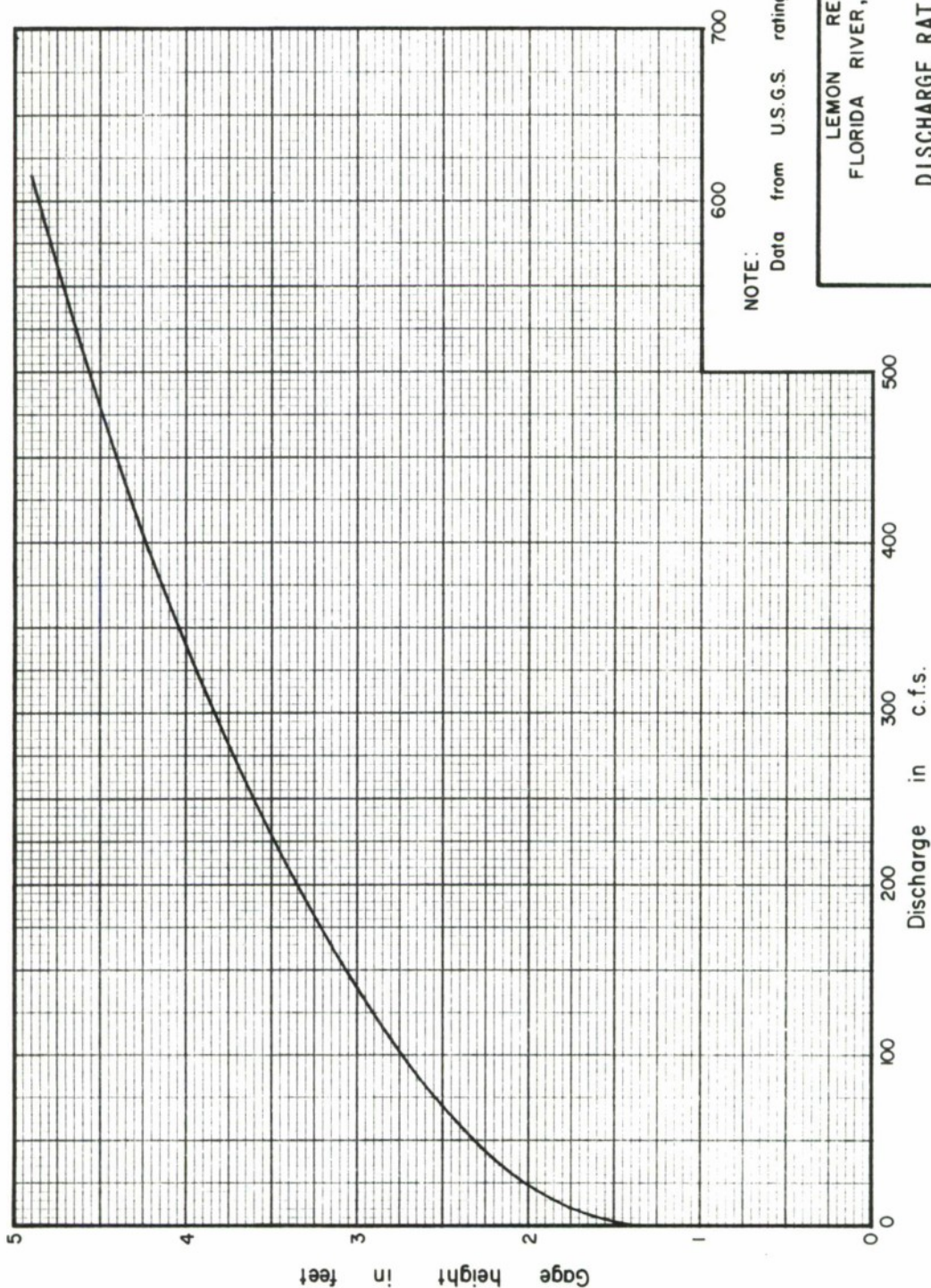
DISCHARGE CURVES FOR TWO 2'-3" X 2'-3" H.P. GATES

DRAWN - G. J. ... SUBMITTED *[Signature]*

TRACED - R. B. ... RECOMMENDED *[Signature]*

CHECKED - H. R. ... APPROVED *[Signature]*

DENVER, COLORADO, APRIL 17, 1963 519-D-199



NOTE:

Data from U.S.G.S. rating table No. 1

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

DISCHARGE RATING CURVE

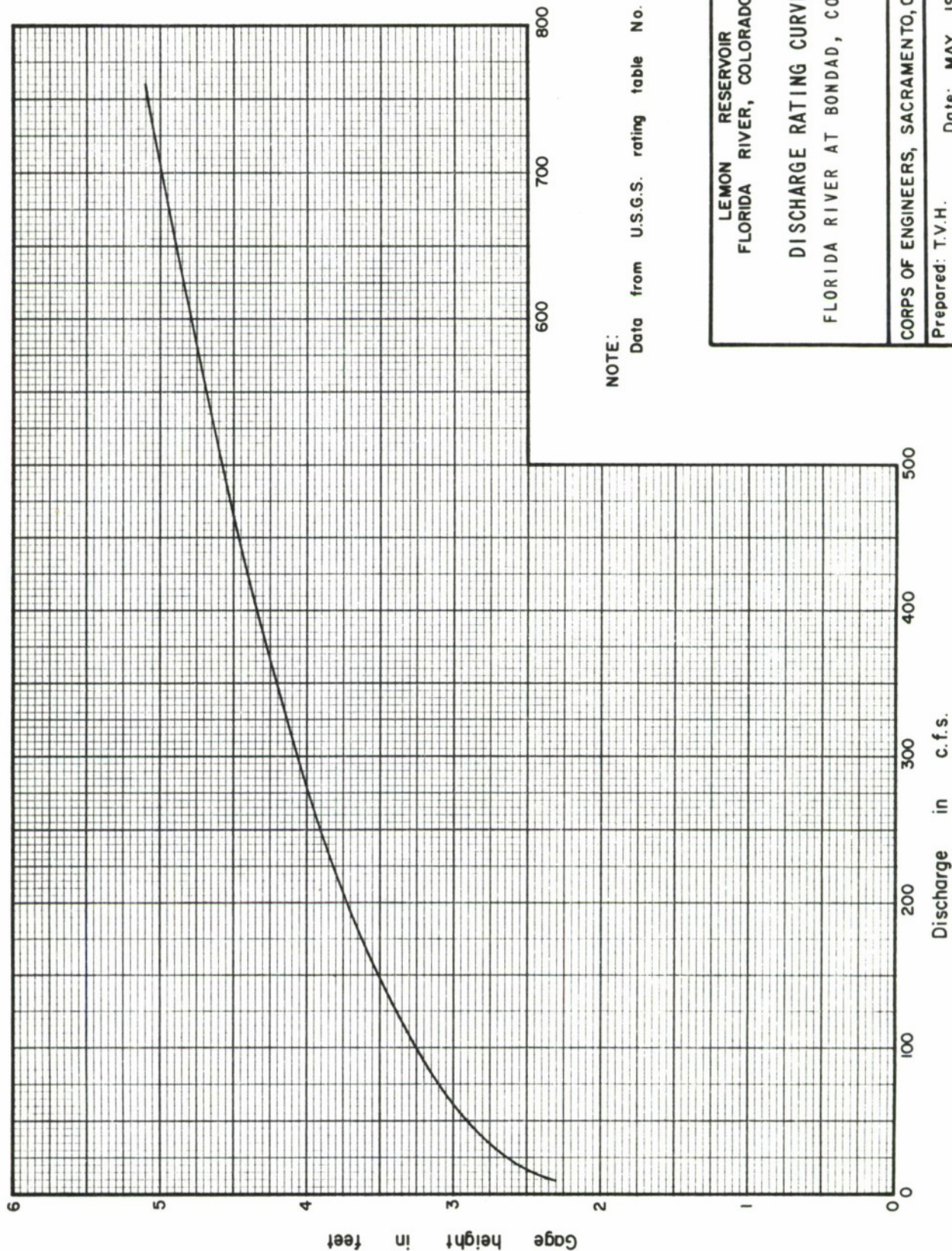
FLORIDA RIVER BELOW FLORIDA FARMERS
DITCH NEAR DURANGO, COLORADO

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H.

Date: MAY 1972

Drawn: T.G.K.



NOTE:

Data from U.S.G.S. rating table No. 6

LEMON RESERVOIR
FLORIDA RIVER, COLORADO

DISCHARGE RATING CURVE

FLORIDA RIVER AT BONDAD, COLORADO

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.V.H.

Date: MAY 1972

Drawn: T.G.K.

LEMON DAM AND RESERVOIR
FLORIDA RIVER, COLORADO

REPORT ON RESERVOIR REGULATION
FOR FLOOD CONTROL

DRAFT

July 1974

APPENDIX A
FLOOD CONTROL REGULATIONS

Department of the Army
Sacramento District, Corps of Engineers
Sacramento, California

absence of any indication that further public comment would shed any new light on the matter, OSHA concludes that no change in the standard is warranted. Accordingly, the ground-fault protection standard at 29 CFR 1910.309(c) and 29 CFR 1926.400(h), as promulgated on December 21, 1976, is hereby reaffirmed.

(Secs. 8(b) and 8(c), Pub. L. 91-598, 84 Stat. 1593, 1599 (29 U.S.C. 855, 857); sec. 107, Pub. L. 91-54, 83 Stat. 98 (40 U.S.C. 333); Secretary of Labor's Order No. 8-76 (41 FR 25059); 29 CFR Part 1911.)

Signed at Washington, D.C., this 3d day of October 1978.

EULA BINGHAM,
Assistant Secretary of Labor.

[FR Doc. 78-28887 Filed 10-12-78; 8:45 am]

[3710-92-M]

Title 33—Navigation and Navigable Waters

CHAPTER II—CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

[ER 1110-2-241]

PART 208—FLOOD CONTROL REGULATIONS

Use of Storage Allocated for Flood Control and Navigation Purposes

AGENCY: U.S. Army Corps of Engineers, DOD.

ACTION: Final rule.

SUMMARY: This revision of 33 CFR 208.11 regulations prescribes the policy and procedure for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation. The revised regulations are applicable to dam and reservoir projects licensed, maintained, and operated under provisions of the Federal Power Act (41 Stat. 1063 (16 U.S.C. 791(A))), Pub. L. 83-436, and other similar authorizing legislation; as well as to reservoir projects constructed wholly or in part with Federal funds as directed by section 7 of the Flood Control Act of 1944. These regulations are intended to establish an understanding between project owners, operating agencies and the Corps of Engineers with regard to certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. Interested persons were given until November 2, 1977 (42 FR 57141) to submit comments. No written comments were received.

DATES: This regulation is effective on October 15, 1978.

ADDRESSES: HQDA (DAEN-CWE-HY) Washington, D.C. 20314.

FOR FURTHER INFORMATION CONTACT:

Mr. Edgar P. Story, Engineering Division, Civil Works Directorate, Office of the Chief of Engineers, Washington, D.C. 20314 202-693-7330.

SUPPLEMENTARY INFORMATION: This final regulation is essentially the same as the proposed rule (42 FR 53637), however, certain reordering has been done of the reference material presented in § 208.11(b). Specifically, excerpts from sections 4(e), 10(a), and 10(c) of the Federal Power Act have been added for improved clarity. Also Federal Power Commission order No. 540 issued October 31, 1975, and published November 7, 1975 (40 FR 51998), amending § 2.9 of the Commission's general policy and interpretations which prescribed standardized conditions (Forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act has been cited and appropriately excerpted. Reference to and citation from article 33 of Federal Power Commission license No. 2009 have been deleted in lieu thereof.

In addition to the proposed action, certain project names and pertinent data are added to and deleted from the list of projects shown in § 208.11(e), list of projects (42 FR 53637). The following projects are added to the list of projects:

- (a) U.S. Army Corps of Engineers, Missouri River Division area: Webster Dam and Lake.
- (b) U.S. Army Corps of Engineers, New England Division area:
 - (i) Bear Swamp Pumped Storage Project.
 - (ii) Turners Falls Reservoir.
- (c) U.S. Army Corps of Engineers, North Pacific Division area:
 - (i) American Falls Dam and Reservoir.
 - (ii) Anderson Ranch Dam and Reservoir.
 - (iii) Arrowrock Dam and Reservoir.
 - (iv) Brownlee Dam and Reservoir.
 - (v) Grand Coulee Dam and Franklin D. Roosevelt Lake.
 - (vi) Hells Canyon Dam and Reservoir.
 - (vii) Kerr Dam and Flathead Lake.
 - (viii) Mayfield Dam and Reservoir.
 - (ix) Mossyrock Dam and Davisson Lake.
 - (x) Oxbow Dam and Reservoir.
 - (xi) Priest Rapids Dam and Reservoir.
 - (xii) Ririe Dam and Reservoir.
 - (xiii) Rocky Reach Dam and Lake Entiat.
 - (xiv) Ross Dam and Reservoir.
 - (xv) Upper Baker Dam and Baker Lake.

- (xvi) Wanapum Dam and Reservoir.
- (xvii) Wells Dam and Lake Pateros.

(d) U.S. Army Corps of Engineers, South Atlantic Division area: Lewis M. Smith Dam and Reservoir.

(e) U.S. Army Corps of Engineers, South Pacific Division area:

- (i) Indian Valley Dam and Reservoir.
- (ii) Lemon Dam and Reservoir.
- (iii) Navajo Dam and Reservoir.
- (iv) Paoina Dam and Reservoir.
- (v) Vallecito Dam and Reservoir.

The following projects are deleted from the list of projects:

- (a) U.S. Army Corps of Engineers, South Atlantic Division area: H. Neely Henry Dam and Reservoir.
- (b) U.S. Army Corps of Engineers, South Pacific Division area:
 - (i) Causey Dam and Reservoir.
 - (ii) Devil Creek Dam and Reservoir.

NOTE.—The Chief of Engineers has determined that this rule does not contain a major proposal requiring preparation of an inflation impact statement under Executive Order 11821 and OMB Circular A-107 (Statutory Authority Pub. L. 90-483).

Dated: October 10, 1978.

CHARLES I. MCGINNIS,
Major General, USA,
Director of Civil Works.

Section 208.11 is revised to read as follows:

§ 208.11 Regulations for use of storage allocated for flood control or navigation and/or project operation at reservoirs subject to prescription of rules and regulations by the Secretary of the Army in the interest of flood control and navigation.

(a) **Purpose.** This regulation prescribes the responsibilities and general procedures for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation, except projects owned and operated by the Corps of Engineers; the International Boundary and Water Commission, United States and Mexico; and those under the jurisdiction of the International Joint Commission, United States, and Canada, and the Columbia River Treaty. The intent of this regulation is to establish an understanding between project owners, operating agencies, and the Corps of Engineers.

(b) **Responsibilities.** The basic responsibilities of the Corps of Engineers regarding project operation are set out in the cited authority and described in the following paragraphs:

(1) Section 7 of the Flood Control Act of 1944 (58 Stat. 890, 33 U.S.C. 709) directs the Secretary of the Army to prescribe regulations for flood control and navigation in the following manner:

Hereafter, it shall be the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations: *Provided*, That this section shall not apply to the Tennessee Valley Authority, except that in case of danger from floods on the lower Ohio and Mississippi Rivers the Tennessee Valley Authority is directed to regulate the release of water from the Tennessee River into the Ohio River in accordance with such instructions as may be issued by the War Department.

(2) Federal Energy Regulatory Commission (formerly Federal Power Commission (FPC)) licenses.

(i) Responsibilities of the Secretary of the Army and/or the Chief of Engineers in Federal Energy Regulatory Commission (FERC) licensing actions are set out in the Federal Power Act. Pertinent sections of that Act are cited herein. The Commission may also stipulate, as part of license conditions, that the licensee enter into an agreement with the Department of the Army providing for operation of the project during flood times, in accordance with rules and regulations prescribed by the Secretary of the Army.

(A) Section 4(e) of the Federal Power Act requires approval by the Chief of Engineers and the Secretary of the Army of plans of dams or other structures affecting the navigable capacity of any navigable waters of the United States, prior to issuance of a license by the Commission as follows:

The Commission is hereby authorized and empowered to issue licenses to citizens . . . for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from or in any of the streams or other bodies of water over which Congress has jurisdiction . . . *Provided further*, That no license affecting the navigable capacity of any navigable waters of the United States shall be issued until the plans of the dam or other structures affecting navigation have been approved by the Chief of Engineers and the Secretary of the Army.

(B) Sections 10(a) and 10(c) of the Federal Power Act specify conditions of project licenses including the following:

(1) Section 10(a). That the project adopted . . . shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use of benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, and for other beneficial public use . . .

(2) Section 10(c). That the licensee shall . . . so maintain and operate said works as

not to impair navigation, and shall conform to such rules and regulations as the Commission may from time to time prescribe for the protection of life, health, and property. . . .

(C) Section 18 of the Federal Power Act directs the operation of any navigation facilities built under the provision of that act, be controlled by rules and regulations prescribed by the Secretary of the Army as follows:

The operation of any navigation facilities which may be constructed as part of or in connection with any dam or diversion structure built under the provisions of this Act, whether at the expense of a licensee hereunder or of the United States, shall at all times be controlled by such reasonable rules and regulations in the interest of navigation; including the control of the pool caused by such dam or diversion structure as may be made from time to time by the Secretary of the Army. . . .

(ii) Federal Power Commission order No. 540 issued October 31, 1975, and published November 7, 1975 (40 FR 51998), amending section 2.9 of the Commission's general policy and interpretations prescribed standardized conditions (forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act. As an example, article 12 of standard form L-3, titled: "Terms and Conditions of License for Constructed Major Projects Affecting Navigable Waters of the United States," sets out the Commission's interpretation of appropriate sections of the Act, which deal with navigation aspects, and attendant responsibilities of the Secretary of the Army in licensing actions as follows:

The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operation of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property. . . ., and the Licensee shall release water from the project reservoir at such rate . . ., as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

(3) Section 9 of Public Law 436, 83d Congress (68 Stat. 303) provides for the development of the Coosa River, Ala. and Ga., and directs the Secretary of the Army to prescribe rules and regulations for project operation in the interest of flood control and navigation as follows:

The operation and maintenance of the dams shall be subject to reasonable rules and regulations of the Secretary of the Army in the interest of flood control and navigation.

NOTE.—This Regulation will also be applicable to dam and reservoir projects operated under provisions of future legislative acts wherein the Secretary of the Army is directed to prescribe rules and regulations in the interest of flood control and navigation. The Chief of Engineers, U.S. Army Corps of Engineers, is designated the duly authorized representative of the Secretary of the Army to exercise the authority set out in the congressional acts. This regulation will normally be implemented by letters of understanding between the Corps of Engineers and project owner and will incorporate the provisions of such letters of understanding prior to the time construction renders the project capable of significant impoundment of water. A water control agreement signed by both parties will follow when deliberate impoundment first begins or at such time as the responsibilities of any corps-owned projects may be transferred to another entity. Promulgation of this regulation for a given project will occur at such time as the name of the project appears in the FEDERAL REGISTER in accordance with the requirements of § 208.11(d)(11). When agreement on a water control plan cannot be reached between the corps and the project owner after coordination with all interested parties, the project name will be entered in the FEDERAL REGISTER and the Corps of Engineers plan will be the official water control plan until such time as differences can be resolved.

(c) *Scope and terminology.* This regulation applies to Federal authorized flood control and/or navigation storage projects, and to non-Federal projects which require the Secretary of the Army to prescribe regulations as a condition of the license, permit or legislation, during the planning, design and construction phases, and throughout the life of the project. In compliance with the authority cited above, this regulation defines certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. In carrying out the conditions of this regulation, the owner and/or operating agency will comply with applicable provisions of Pub. L. 85-624, the Fish and Wildlife Coordination Act of 1958, and Pub. L. 92-500, the Federal Water Pollution Control Act Amendments of 1972. This regulation does not apply to local flood protection works governed by § 208.10, or to navigation facilities and associated structures which are otherwise covered by part 207 (Navigation Regulations) of title 33 of the code. Small reservoirs, containing less than 12,500 acre-feet of flood control or navigation storage, may be excluded from this regulation and covered under § 208.10, unless specifically required by law or conditions of the license or permit.

(1) The terms "reservoir" and "project" as used herein include all water resource impoundment projects constructed or modified, including natural lakes, that are subject to this regulation.

(2) The term "project owner" refers to the entity responsible for maintenance, physical operation, and safety of the project, and for carrying out the water control plan in the interest of flood control and/or navigation as prescribed by the Corps of Engineers. Special arrangements may be made by the project owner for "operating agencies" to perform these tasks.

(3) The term "letter of understanding" as used herein includes statements which consummate this regulation for any given project and define the general provisions or conditions of the local sponsor, or owner, cooperation agreed to in the authorizing legislative document, and the requirements for compliance with section 7 of the 1944 Flood Control Act, the Federal Power Act or other special congressional act. This information will be specified in the water control plan and manual. The letter of understanding will be signed by a duly authorized representative of the Chief of Engineers and the project owner. A "field working agreement" may be substituted for a letter of understanding, provided that the specified minimum requirements of the latter, as stated above, are met.

(4) The term "water control agreement" refers to a compilation of water control criteria, guidelines, diagrams, release schedules, rule curves and specifications that basically govern the use of reservoir storage space allocated for flood control or navigation and/or release functions of a water control project for these purposes. In general, they indicate controlling or limiting rates of discharge and storage space required for flood control and/or navigation, based on the runoff potential during various seasons of the year.

(5) For the purpose of this regulation, the term "water control plan" is limited to the plan of regulation for a water resources project in the interest of flood control and/or navigation. The water control plan must conform with proposed allocations of storage capacity and downstream conditions or other requirements to meet all functional objectives of the particular project, acting separately or in combination with other projects in a system.

(6) The term "real-time" denotes the processing of current information or data in a sufficiently timely manner to influence a physical response in the system being monitored and controlled. As used herein the term connotes "... the analyses for and execution of water control decisions for both minor and major flood events and for navigation, based on prevailing hydrometeorological and other conditions and constraints, to achieve efficient management of water resource systems.

(d) *Procedures.* (1) *Conditions during project formulation.* During the planning and design phases, the project owner should consult with the Corps of Engineers regarding the quantity and value of space to reserve in the reservoir for flood control and/or navigation purposes, and for utilization of the space, and other requirements of the license, permit or conditions of the law. Relevant matters that bear upon flood control and navigation accomplishment include: runoff potential, reservoir discharge capability, downstream channel characteristics, hydrometeorological data collection, flood hazard, flood damage characteristics, real estate acquisition for flowage requirements (fee and easement), and resources required to carry out the water control plan. Advice may also be sought on determination of and regulation for the probable maximum or other design flood under consideration by the project owner to establish the quantity of surcharge storage space, and freeboard elevation of top of dam or embankment for safety of the project.

(2) *Corps of Engineers involvement.* If the project owner is responsible for real-time implementation of the water control plan, consultation and assistance will be provided by the Corps of Engineers when appropriate and to the extent possible. During any emergency that affects flood control and/or navigation, the Corps of Engineers may temporarily prescribe regulation of flood control or navigation storage space on a day-to-day (real-time) basis without request of the project owner. Appropriate consideration will be given for other authorized project functions. Upon refusal of the project owner to comply with regulations prescribed by the Corps of Engineers, a letter will be sent to the project owner by the Chief of Engineers or his duly authorized representative describing the reason for the regulations prescribed, events that have transpired, and notification that the project owner is in violation of the Code of Federal Regulations. Should an impasse arise, in that the project owner or the designated operating entity persists in noncompliance with regulations prescribed by the Corps of Engineers, measures may be taken to assure compliance.

(3) *Corps of Engineers implementation of real-time water control decisions.* The Corps of Engineers may prescribe the continuing regulation of flood control storage space for any project subject to this regulation on a day-to-day (real-time) basis. When this is the case, consultation and assistance from the project owner to the extent possible will be expected. Special requests by the project owner, or appropriate operating entity, are preferred

before the Corps of Engineers offers advice on real-time regulation during surcharge storage utilization.

(4) *Water control plan and manual.* Prior to project completion, water control managers from the Corps of Engineers will visit the project and the area served by the project to become familiar with the water control facilities, and to insure sound formulation of the water control plan. The formal plan of regulation for flood control and/or navigation, referred to herein as the water control plan, will be developed and documented in a water control manual prepared by the Corps of Engineers. Development of the manual will be coordinated with the project owner to obtain the necessary pertinent information, and to insure compatibility with other project purposes and with surcharge regulation. Major topics in the manual will include: Authorization and description of the project, hydrometeorology, data collection and communication networks, hydrologic forecasting, the water control plan, and water resource management functions, including responsibilities and coordination for water control decisionmaking. Special instructions to the dam tender or reservoir manager on data collection, reporting to higher Federal authority, and on procedures to be followed in the event of a communication outage under emergency conditions, will be prepared as an exhibit in the manual. Other exhibits will include copies of this regulation, letters of understanding consummating this regulation, and the water control agreements. After approval by the Chief of Engineers or his duly authorized representative, the manual will be furnished the project owner.

(5) *Water control agreement.* (1) A water control diagram (graphical) will be prepared by the Corps of Engineers for each project having variable space reservation for flood control and/or navigation during the year; e.g., variable seasonal storage, joint-use space, or other rule curve designation. Reservoir inflow parameters will be included on the diagrams when appropriate. Concise notes will be included on the diagrams prescribing the use of storage space in terms of release schedules, runoff, nondamaging or other controlling flow rates downstream of the damsite, and other major factors as appropriate. A water control release schedule will be prepared in tabular form for projects that do not have variable space reservation for flood control and/or navigation. The water control diagram or release schedule will be signed by a duly authorized representative of the Chief of Engineers, the project owner, and the designated operating agency, and will be used as the basis for carrying out this

regulation. Each diagram or schedule will contain a reference to this regulation.

(ii) When deemed necessary by the Corps of Engineers, information given on the water control diagram or release schedule will be supplemented by appropriate text to assure mutual understanding on certain details or other important aspects of the water control plan not covered in this regulation, on the water control diagram or in the release schedule. This material will include clarification of any aspects that might otherwise result in unsatisfactory project performance in the interest of flood control and/or navigation. Supplementation of the agreement will be necessary for each project where the Corps of Engineers exercises the discretionary authority to prescribe the flood control regulation on a day-to-day (real-time) basis. The agreement will include delegation of the responsibility. The document should also cite, as appropriate, section 7 of the 1944 Flood Control Act, the Federal Power Act and/or other congressional legislation authorizing construction and/or directing operation of the project.

(iii) All flood control regulations published in the *FEDERAL REGISTER* under this section (part 208) of the code prior to the date of this publication which are listed in paragraph 208.11(e) are hereby superseded.

(iv) Nothing in this regulation prohibits the promulgation of specific regulations for a project in compliance with the authorizing acts, when agreement on acceptable regulations cannot be reached between the Corps of Engineers and the owner.

(6) *Hydrometeorological instrumentation.* The project owner will provide instrumentation in the vicinity of the damsite and will provide communication equipment necessary to record and transmit hydrometeorological and reservoir data to all appropriate Federal authorities on a real-time basis unless there are extenuating circumstances or are otherwise provided for as a condition of the license or permit. For those projects where the owner retains responsibility for real-time implementation of the water control plan, the owner will also provide or arrange for the measurement and reporting of hydrometeorological parameters required within and adjacent to the watershed and downstream of the damsite, sufficient to regulate the project for flood control and/or navigation in an efficient manner. When data collection stations outside the immediate vicinity of the damsite are required, and funds for installation, observation, and maintenance are not available from other sources, the Corps of Engineers may agree to share the costs for such stations with the

project owner. Availability of funds and urgency of data needs are factors which will be considered in reaching decisions on cost sharing.

(7) *Project safety.* The project owner is responsible for the safety of the dam and appurtenant facilities and for regulation of the project during surcharge storage utilization. Emphasis upon the safety of the dam is especially important in the event surcharge storage is utilized, which results when the total storage space reserved for flood control is exceeded. Any assistance provided by the Corps of Engineers concerning surcharge regulation is to be utilized at the discretion of the project owner, and does not relieve the owner of the responsibility for safety of the project.

(8) *Notification of the general public.* The Corps of Engineers and other interested Federal and State agencies, and the project owner will jointly sponsor public involvement activities, as appropriate, to fully apprise the general public of the water control plan. Public meetings or other effective means of notification and involvement will be held, with the initial meeting being conducted as early as practicable but not later than the time the project first becomes operational. Notice of the initial public meeting shall be published once a week for 3 consecutive weeks in one or more newspapers of general circulation published in each county covered by the water control plan. Such notice shall also be used when appropriate to inform the public of modifications in the water control plan. If no newspaper is published in a county, the notice shall be published in one or more newspapers of general circulation within that county. For the purposes of this section a newspaper is one qualified to publish public notices under applicable State law. Notice shall be given in the event significant problems are anticipated or experienced that will prevent carrying out the approved water control plan or in the event that an extreme water condition is expected that could produce severe damage to property or loss of life. The means for conveying this information shall be commensurate with the urgency of the situation. The water control manual will be made available for examination by the general public upon request at the appropriate office of the Corps of Engineers, project owner or designated operating agency.

(9) *Other generalized requirements for flood control and navigation.* (i) Storage space in the reservoirs allocated for flood control and navigation purposes shall be kept available for those purposes in accordance with the water control agreement, and the plan

of regulation in the water control manual.

(ii) Any water impounded in the flood control space defined by the water control agreement shall be evacuated as rapidly as can be safely accomplished without causing downstream flows to exceed the controlling rates; i.e., releases from reservoirs shall be restricted insofar as practicable to quantities which, in conjunction with uncontrolled runoff downstream of the dam, will not cause water levels to exceed the controlling stages currently in force. Although conflicts may arise with other purposes, such as hydropower, the plan or regulation may require releases to be completely curtailed in the interest of flood control or safety of the project.

(iii) Nothing in the plan of regulation for flood control shall be construed to require or allow dangerously rapid changes in magnitudes of releases. Releases will be made in a manner consistent with requirements for protecting the dam and reservoir from major damage during passage of the maximum design flood for the project.

(iv) The project owner shall monitor current reservoir and hydro-meteorological conditions in and adjacent to the watershed and downstream of the damsite, as necessary. This and any other pertinent information shall be reported to the Corps of Engineers on a timely basis, in accordance with standing instructions to the dam tender or other means requested by the Corps of Engineers.

(v) In all cases where the project owner retains responsibility for real-time implementation of the water control plan, he shall make current determinations of: Reservoir inflow, flood control storage utilized, and scheduled releases. He shall also determine storage space and releases required to comply with the water control plan prescribed by the Corps of Engineers. The owner shall report this information on a timely basis as requested by the Corps of Engineers.

(vi) The water control plan is subject to temporary modification by the Corps of Engineers if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communication available. The action taken shall be confirmed in writing the same day to the project owner and shall include justification for the action.

(vii) The project owner may temporarily deviate from the water control plan in the event an immediate short-term departure is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other serious hazards. Such actions shall be immediately reported by the fastest

means of communication available. Actions shall be confirmed in writing the same day to the Corps of Engineers and shall include justification for the action. Continuation of the deviation will require the express approval of the Chief of Engineers, or his duly authorized representative.

(viii) Advance approval of the Chief of Engineers, or his duly authorized representative, is required prior to any deviation from the plan of regulation prescribed or approved by the Corps of Engineers in the interest of flood control and/or navigation, except in emergency situations provided for in paragraph (d)(9)(vii) of this section. When conditions appear to warrant a prolonged deviation from the approved plan, the project owner and the Corps of Engineers will jointly investigate and evaluate the proposed deviation to insure that the overall integrity of the plan would not be unduly compromised. Approval of prolonged deviations will not be granted unless such investigations and evaluations have been conducted to the extent deemed necessary by the Chief of Engineers, or his designated representatives, to fully substantiate the deviation.

(10) *Revisions.* The water control plan and all associated documents will be revised by the Corps of Engineers, as necessary, to reflect changed conditions that come to bear upon flood control and navigation, e.g., reallocation of reservoir storage space due to sedimentation or transfer of storage space to a neighboring project. Revision of the water control plan, water control agreement, water control diagram, or release schedule requires approval of the Chief of Engineers or his duly authorized representative. Each such revision shall be effective upon the date specified in the approval. The

original (signed document) water control agreement shall be kept on file in the Office, Chief of Engineers, Department of the Army, Washington, D.C. Copies of the agreement shall be kept on file and may be obtained from the office of the project owner, or from the office of the appropriate Division Engineer, Corps of Engineers.

(11) *Federal Register.* The following information for each project subject to section 7 of the 1944 Flood Control Act and other applicable congressional acts shall be published in the *FEDERAL REGISTER* prior to the time the projects becomes operational and prior to any significant impoundment before project completion or . . . at such time as the responsibility for physical operation and maintenance of the Corps of Engineers owned projects is transferred to another entity: (i) Reservoir, dam, and lake names, (ii) stream, county, and State corresponding to the damsite location, (iii) the maximum current storage space in acre-feet to be reserved exclusively for flood control and/or navigation purposes, or any multiple-use space (intermingled) when flood control or navigation is one of the purposes, with corresponding elevations in feet above mean sea level, and area in acres at the upper and lower limits of said space, (iv) the name of the project owner, and (v) congressional legislation authorizing the project for Federal participation.

(e) *List of projects.* The following tables, "Pertinent Project Data—Section 208.11 Regulation," show the pertinent data for projects which are subject to this regulation.

(Sec. 7, Pub. L. 78-534, 58 Stat. 890 (33 U.S.C. 709); the Federal Power Act, 41 Stat. 1063 (16 U.S.C. 791(A)); and Sec. 9, Pub. L. 83-436, 68 Stat. 303.)

[FR Doc. 78-29100 Filed 10-12-78; 8:45 am]

RULES AND REGULATIONS

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PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS																		
PROJECT NAME	COUNTY & STATE	STREAM	EXCLUSIVE						MULTIPLE-USE								PROJECT OWNER	AUTH. LEGIS.
			FLOOD CONTROL/NAVIGATION				FLOOD CONTROL/NAVIGATION				FLOOD CONTROL/NAVIGATION							
			STORAGE 1000 ac-ft	ELEV. UPPER feet m.s.l.	ELEV. LOWER feet m.s.l.	AREA UPPER acre	AREA LOWER acre	STORAGE 1000 ac-ft	ELEV. UPPER feet m.s.l.	ELEV. LOWER feet m.s.l.	AREA UPPER acre	AREA LOWER acre						
Alpine Dam	Winnebago, IL	Kelth Creek	0.585	796.0	764.0	51.88	0								City of Rockford, IL	PWA Proj.		
Agency Valley Dam & Res	Malheur, OR	N. Fork Snake River	-	-	-	-	-	-	60.0	3340.0	3263.21	1,900	0		Bureau of Reclamation	PL 68-292		
American Falls Dam & Reservoir	Pomer, ID	Snake River	-	-	-	-	-	-	1,700	4343.2	4295.6	56,100	0		Bureau of Reclamation	FPC NO. 2259		
Anderson Ranch Dam & Reservoir	Elmore, ID	S. Fork Boise River	-	-	-	-	-	-	423.2	4196.0	4043.0	4,740	1,150		Bureau of Reclamation	Rec. Proj. Act of 1989 (53 Stat. 1187)		
Arrowrock Dam & Reservoir	Elmore, ID	Boise River	-	-	-	-	-	-	286.6	3216.0	2967.0	3,100	200		Bureau of Reclamation	Rec. Act of 17 Jun 1902 (32 Stat. 388)		
Bear Creek Dam	Marion & Rail, MO	Bear Creek	8.7	546.5	523.0	540	0		-	-	-	-	-		City of Hannibal, MO	PL 83-780		
Bear Swamp Pumped Storage Proj.	Franklin, MA	Trih. of Deerfield River	-	-	-	-	-	-	(No specific FC/Nav. Storage Allocation)						New Eng Power CO.	Fed. Power Act.		
Big Dry Creek and Diversion	Fresno, CA	Big Dry Creek and Dog Creek	16.25	425.0	193.0	1,530	0		-	-	-	-	-		Reclamation Board CA	PL 77-228		
Bonny Dam & Reservoir	Yuma, CO	S. Fork Republican River	128.8	3710.0	3672.0	5,036	2,042		-	-	-	-	-		Bureau of Reclamation	PL 78-534		
Boysen Dam & Reservoir	Fremont, WY	Wind River	146.0	4732.0	4725.0	22,100	19,560		146.1	4725.0	4717.0	19,560	16,955		Bureau of Reclamation	PL 78-534		
Brownlee Dam & Reservoir	Baker, OR; Washington, ID	Snake River	-	-	-	-	-	-	980.3	2077.0	1976.0	13,840	6,650		Idaho Power Company	FPC No. 1971-C		
Bully Creek Dam & Reservoir	Malheur, OR	Bully Creek	-	-	-	-	-	-	31.65	2523.0	2456.8	1,082	140		Bureau of Reclamation	PL 86-248		
Cananche Dam & Reservoir	San Joaquin, CA	Mokelumne River	-	-	-	-	-	-	200.0	235.5	205.1	7,600	5,507		East Bay Mun Util Dist.	PL 86-645		
Canyon Ferry Dam & Lake	Lewis & Clark, MT	Missouri Riv.	104.3	3620.0	3797.0	35,181	34,435		799.1	3797.0	3770.0	34,435	24,126		Oakland, CA Bureau of Reclamation	PL 78-534		

FEDERAL REGISTER, VOL. 43, NO. 199—FRIDAY, OCTOBER 13, 1978

PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PROJECT NAME	STREAM	COUNTY & STATE	EXCLUSIVE					MULTIPLE-USE					PROJECT OWNER	AUTH. LEGIS.
			FLOOD CONTROL/NAVIGATION					FLOOD CONTROL/NAVIGATION						
			STORAGE 1000 ac-ft	ELEV. LIMITS feet m.s.l.	UPPER	LOWER	AREA acres	STORAGE 1000 ac-ft	ELEV. LIMITS feet m.s.l.	UPPER	LOWER	AREA acres		
Cedar Bluff Dam & Reservoir	Smoky Hill River	Trego, KS	191.9	2166.0	2144.0	10,790	6,869	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Clark Canyon Dam & Reservoir	Beaverhead River	Beaverhead, MT	79.1	5560.4	5546.1	5,903	5,160	50.4	5546.1	5535.7	5,160	4,496	Bureau of Reclamation	PL 78-534
Del Valla Dam & Reservoir	Alameda Creek	Alameda, CA	37.0	745.0	703.1	1,060	710	1.0	703.1	702.2	710	700	LA Dept of Water Resources	PL 87-874
East Canyon Dam & Reservoir	East Canyon Creek	Morgan, UT	-	-	-	-	-	48.0	5705.5	5577.0	684	127	Bureau of Reclamation	PL 81-273
Echo Dam and Reservoir	Webber River	Summit, UT	-	-	-	-	-	74.0	5560.0	5450.0	1,455	0	Bureau of Reclamation	PL 81-273
Emigrant Dam & Reservoir	Emigrant Creek	Jackson, OR	39.0	2241.0	2131.5	801	80	-	-	-	-	-	Bureau of Reclamation	PL 83-606
Endara Dam & Reservoir	Frenchman Creek	Chase, NB	30.0	3127.0	3112.3	2,405	1,707	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Folsom Dam & Lake	American River	Sacramento, CA	-	-	-	-	-	400.0	466.0	427.0	11,450	9,040	Bureau of Reclamation	PL 81-356
Friant Dam & Reservoir	San Joaquin River	Fresno, CA	-	-	-	-	-	390.0	578.0	466.3	4,850	2,101	Bureau of Reclamation	PL 75-392
Gaston-Roanoke Rapids Dam & Reservoir	Roanoke River	Northampton & Halifax, NC	63.0	203.0	200.0	22,500	20,300	-	-	-	-	-	VA Electric & Power Co.	PL 76-868
Glan Elder Dam & Waconda Lake	Solomon River	Mitchell, KS	722.3	1488.3	1455.6	30,682	12,602	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Glendo Dam & Reservoir	N. Platte River	Platte, WY	271.9	4653.0	4635.0	17,986	12,365	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Grand Coulee Dam, Franklin D. Roosevelt Lake	Columbia River	Grant & Okanogan, WA	-	-	-	-	-	5185.45	1290.0	1208.0	82,280	45,592	Bureau of Reclamation	PL 89-561
Heart Butte Dam & Lake Tachida	Heart River	Grant, ND	150.0	2094.5	2064.5	6,625	3,400	-	-	-	-	-	Bureau of Reclamation	PL 78-534

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PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PROJECT NAME	STREAM	COUNTY & STATE	EXCLUSIVE										MULTIPLE-USE										PROJECT OWNER	AUTH. LEGIS.
			FLOOD CONTROL/NAVIGATION					FLOOD CONTROL/NAVIGATION					FLOOD CONTROL/NAVIGATION					FLOOD CONTROL/NAVIGATION						
			STORAGE 1000 ac-ft	ELEV. UPPER feet m.s.l.	LIMITS LOWER	ARFA UPPER acres	LOWER	STORAGE 1000 ac-ft	ELEV. UPPER feet m.s.l.	LIMITS LOWER	AREA UPPER acres	LOWER	STORAGE 1000 ac-ft	ELEV. UPPER feet m.s.l.	LIMITS LOWER	AREA UPPER acres	LOWER							
Hells Canyon Dam & Reservoir	Snake River	Wallows, OR; Adams, ID	-	-	-	-	-	-	-	-	11.7	1688.0	1683.0	2,380	2,280	Idaho Power Company	FPC No. 1971-A							
Hoover Dam & Reservoir	Colorado River	Clark NV & Mohave, AZ	1500.0	1229.0	1219.6	162,700	156,500	-	-	-	15.853	1219.6	1083.0	156,500	83,500	Bureau of Reclamation	PL 70-642							
Lake Head Dam & Reservoir	S. Fork Flathead Riv.	Flathead, MT	2982.0	3560.0	3336.0	23,800	5,400	-	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-329							
Indian Valley Dam & Reservoir	N. Fork Cache Creek	Lake, CA	-	-	-	-	-	-	-	-	40.0	1485.0	1474.7	3,975	3,749	Yoto City Fl. PL 84-984	PL 84-984							
Dam Reservoir	James River	Stutsman, ND	185.4	1454.0	1432.67	13,206	2,555	-	-	-	6.6	1432.67	1429.8	2,555	2,085	Cont'd. Reclamation	PL 78-534							
Jamestown Dam & Reservoir	Flathead River	Lake, MT	-	-	-	-	-	-	-	-	1219.0	2893.0	2883.0	125,560	120,000	Reclamation Power Co.	FPC No. 5							
Kerr Dam	Flathead Lake	Crook, WY	140.2	4111.5	4039.3	13,686	9,394	-	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-534							
Keyhole Dam & Reservoir	Belle Fourche	Phillips, KS	215.1	1757.3	1729.25	10,640	5,073	-	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-534							
Kirwin Dam & Reservoir	N. Fork Solomon River	La Plata, Colorado	-	-	-	-	-	-	-	-	39.0	8148	8023	622	62	Bureau of Reclamation	PL 84-485							
Lemon Dam & Reservoir	Florida River	Cullman & Walker, AL	280.6	522.0	510.0	25,700	21,200	-	-	-	-	-	-	-	-	Alabama Power Co.	Fed. Power Act							
Lewis M. Smith Dam & Reservoir	Sipsey Fork Elack Warrior Riv.	Blain, ID	30.0	5237.3	5127.8	574	0	-	-	-	-	-	-	-	-	Bureau of Reclamation	PL 84-993							
Little Wood River Dam & Reservoir	Little Wood River	Talladega, AL	245.3	477.0	465.0	26,310	15,260	-	-	-	-	-	-	-	-	Alabama Power Co.	PL 83-436							
Logan Martin Dam & Reservoir	Coosa River	Merced, CA	-	-	-	-	-	-	-	-	14.0	353.5	327.8	619	467	Bureau of Reclamation	PL 86-488							
Los Banos Dam & Reservoir	Los Banos Creek	Morgan, UT	-	-	-	-	-	-	-	-	20.0	6005.0	5912.0	365	93	Bureau of Reclamation	PL 81-273							
Detention Res.	Lost Creek	Jewell, KS	50.5	1595.3	1582.6	5,025	2,986	-	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-534							
Lost Creek Dam & Res.	White Rock																							
Lovewall Dam & Reservoir	White Rock Creek																							

PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PROJECT NAME	COUNTY & STATE	EXCLUSIVE				MULTIPLE-USE						PROJECT OWNER	AUTH. LEGIS.
		FLOOD CONTROL/NAVIGATION				FLOOD CONTROL/NAVIGATION							
		STORAGE 1000 ac-ft	ELEV. LIMITS m.s.l.	UPPER	LOWER	STORAGE 1000 ac-ft	ELEV. LIMITS m.s.l.	UPPER	LOWER	AREA acres	AREA acres		
Markham Ferry Dam & Lake	Mayes, OK	244.2	636.0	619.0	18,000	10,900	-	-	-	-	-	Grand River Dam Authority	PL 76-476
Wash E. Hudson Mayfield Dam & Reservoir	Lewis, WA	-	-	-	-	-	21.4	425.0	415.0	2,070	1,825	City of Tacoma	FPC No. 2016-A
Medicina Creek Dam & Harry Strunk Lake	Frontiar,NB	52.2	2386.2	2366.1	3,465	1,850	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Mosayrock Dam	Lewis,WA	-	-	-	-	-	1397.0	778.5	621.5	11,800	5,000	City of Tacoma	FPC No. 2016-B
Daviason Lake Reservoir	Rio Arriba & San Juan,NM	-	-	-	-	-	1036.1	6085	5990	15,610	7,400	Bureau of Reclamation	PL 84-485
New Exchequer Dam & Lake	Tuolome,CA	-	-	-	-	-	400.0	867.0	799.7	7,110	4,849	Marcad Irrig. District	PL 86-645
Norton Dam & Reservoir	Norton, KS	98.8	2331.4	2304.3	5,316	2,181	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Ochocho Dam & Reservoir	Crook, OR	51.4	3136.2	3048.1	1,150	120	-	-	-	-	-	Bureau of Reclamation	PL 84-992
Oroville Dam & Lake	Butte, CA	-	-	-	-	-	750.0	900.0	848.5	15,800	13,346	Reclamation CA Dept of Wtr Resources	PL 85-500
Oxbow Dam & Reservoir	Baker, OR;	-	-	-	-	-	5.0	1805.0	1800.0	1,165	1,115	Idaho Power Company	FPC No. 1971-B
Pactola Dam & Reservoir	Adams, ID	43.0	4621.5	4580.2	1,232	860	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Palisades Dam & Reservoir	Pennington,SD	1202.0	5620.0	5452.43	16,100	2,170	-	-	-	-	-	Bureau of Reclamation	PL 81-864
Padina Dam & Reservoir	Bonneville, ID	-	-	-	-	-	17.0	6447.5	6373.0	334	120	Reclamation Bureau of	PL 80-117
Pineview Dam & Reservoir	Gunnison, Colorado	-	-	-	-	-	110.0	4900.0	4818.0	2,874	0	Reclamation Bureau of	PL 84-485
Platora Dam & Reservoir	Weber, UT	-	-	-	-	-	540.0	10027.5	994.5	920	0	Reclamation Bureau of	PL 81-273
Priest Rapids Dam & Reservoir	Conajas,CO	6.0	10034.0	10027.5	947	920	-	-	-	-	-	Reclamation Bureau of	PL 76-640
Dam & Reservoir	Grant, WA	-	-	-	-	-	44.0	488.0	481.5	7,100	6,500	Grant County	FPC No. 2114-A
Prinaville Dam & Reservoir	Crook, OR	153.0	3234.8	3112.0	2,990	120	-	-	-	-	-	Bureau of Reclamation	PL 84-992

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PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PROJECT NAME	STREAM	COUNTY & STATE	EXCLUSIVE				MULTIPLE-USE						PROJECT OWNER	AUTH. LEGIS.		
			FLOOD CONTROL/NAVIGATION				FLOOD CONTROL/NAVIGATION									
			STORAGE 1000 ac-ft	ELEV. UPPER	LIMITS LOWER	AREA acres	STORAGE 1000 ac-ft	ELEV. UPPER	LIMITS LOWER	AREA acres						
Prosser Creek & Reservoir	Prosser Creek	Nevada, CA	-	-	-	-	-	-	-	20.0	5741.2	5703.7	745	334	Bureau of Reclamation	PL 84-858
Red Willow Dam & Hugh Butler Creek Lake	Red Willow Creek	Frontier, NB	48.9	2604.9	2581.8	2,682	1,629	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-534 PL 85-783
Ririe Dam & Reservoir	Willow Creek	Bonneville, ID	-	-	-	-	-	-	-	90.0	5119.0	5023.0	1,560	360	Bureau of Reclamation	PL 87-874
Rocky Reach Dam	Snake River	Chelan, WA	-	-	-	-	-	-	-	37.0	707.0	703.0	9,600	0	Chelan County	PFC No. 2145
Lake Entiat	River	Whatcom, WA	-	-	-	-	-	-	-	530.5	1602.5	1475.0	6,000	2,168	PUD No. 1	PFC No. 553-C
Rosa Dam & Reservoir	Skagit River	Garrett, MD	-	-	-	-	-	-	-	16,028	1468.5	1400.0	366	127	City of Seattle	PL 79-526
Savage River Dam & Res.	Savage River	Perkins, SD	217.7	2302.0	2272.0	9,900	4,800	-	-	-	-	-	-	-	Potomac River Commission	PL 78-534
Shadehill Dam & Reservoir	Grand River	Shasta, CA	-	-	-	-	-	-	-	1300.0	1067.0	1018.6	29,570	23,894	Bureau of Reclamation	PL 75-392
Smith Mtn & Reservoir	Roanoke River	Bedford, Campbell & Pittsylvania, VA	-	-	-	-	-	-	-	(No Specific FC/Nav. Storage Allocation)	-	-	-	-	Bureau of Reclamation	PL 76-868 Fed. Power Act
Leesville Dam & Res.	Republican River	Hitchcock, NB	133.8	2773.0	2752.0	7,975	4,974	-	-	-	-	-	-	-	Bureau of Reclamation	PL 78-534
Trenton Dam & Reservoir	Connecticut River	Franklin, MA	-	-	-	-	-	-	-	(No Specific FC/Nav. Storage Allocation)	-	-	-	-	Northeast Utilities Service Co.	Fed. Power Act
Turner Falls Res (Includes Northfield Mtn Brook)	Turner Falls Reservoir	Santa Barbara, CA	89.0	651.5	623.0	3,690	2,650	-	-	-	-	-	-	-	Bureau of Reclamation	PL 83-774
Pumped Storage Project	Cuyama River	Whatcom, WA	-	-	-	-	-	-	-	220.63	724.0	655.0	4,890	0	Puget Sound Power & Light Co.	Sec. 201 PL 89-298 PFC No. - 2150-B
Upper Baker Dam	Baker River		-	-	-	-	-	-	-	-	-	-	-	-		
Lake			-	-	-	-	-	-	-	-	-	-	-	-		

PERTINENT PROJECT DATA - SECTION 208.11 REGULATIONS

PROJECT NAME	STREAM	COUNTY & STATE	MULTIPLE-USE										PROJECT OWNER	AUTH. LEGIS.	
			EXCLUSIVE					FLOOD CONTROL/NAVIGATION							
			STORAGE 1000 ac-ft		ELEV. LIMITS feet m.s.l.		AREA acres	STORAGE 1000 ac-ft		ELEV. LIMITS feet m.s.l.		AREA acres			
UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	LOWER				
Vallacito Dam Reservoir	Los Pinos River	La Plata, Colorado	-	-	-	-	-	-	115.4	7665	7600	2,723	693	Bureau of Reclamation	PL 61-288
Wanapum Dam & Reservoir	Columbia River	Grant, WA	-	-	-	-	-	-	151.6	571.5	560.0	14,400	9,600	Grant County	PL 68-292
Wanship Dam & Reservoir	Weber River	Summit, UT	-	-	-	-	-	-	61.0	6037.0	5930.0	1,077	121	PUD No. 2	FPC No. 2114-B
Rockport Warm Springs Dam & Res.	Middle Fork Malheur Riv.	Malheur, OR	-	-	-	-	-	-	191.0	3406.0	3327.0	4,600	90	Bureau of Reclamation	PL 81-273
Waterbury Dam & Reservoir	Little River	Washington, VT	27.7	617.5	592.0	1,330	890	-	-	-	-	-	-	503Vale Irr Dist & 502 Bu. of Rec.	PL 78-534
Waseca Dam & Reservoir	Coosa River	Cherokee, AL	397.0	574.0	564.0	50,000	30,200	-	-	-	-	-	-	State of Vermont	PL 83-436
Walla Dam & Laka Pataros	Columbia River	Douglas, WA	-	-	-	-	-	-	74.0	779.0	771.0	10,700	7,700	Power Co.	Douglas Co., FPC No. 2149
Webster Dam & Reservoir	S. Fork Solomon Riv.	Rooks, KS	183.4	1923.7	1892.45	8,480	3,765	-	-	-	-	-	-	PUD No. 1	Bureau of Reclamation
Yellowtail Dam & Bighorn Laka	Bighorn River	Big Horn, MT	259.0	3657.0	3640.0	17,298	12,685	250.0	3640.0	3614.0	12,685	7,410	Reclamation	PL 534-78-2	Bureau of Reclamation

FIELD WORKING AGREEMENT
BETWEEN
DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION
AND
DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS
FOR
FLOOD CONTROL OPERATION
OF
UPPER COLORADO BASIN DAMS AND RESERVOIRS
IN
COLORADO, NEW MEXICO, UTAH AND WYOMING

THIS agreement, made and entered into this 23RD day of March
1978, between the Bureau of Reclamation and the Corps of Engineers,

WITNESSETH THAT:

WHEREAS, the Department of the Interior, acting through the Bureau of Reclamation, represented by its appropriate Regional Director, has constructed dams and reservoirs on the Upper Colorado Basin Rivers and their tributaries, and is responsible for normal operation and structural safety of the projects, and

WHEREAS, the Department of the Army, acting through the Corps of Engineers, represented by its appropriate District and Division Engineers, is responsible for the flood control operation plans of said dams and reservoirs in accordance with Section 7 of the 1944 Flood Control Act (33 U.S.C. 709) and as promulgated in Code of Federal Regulations, Title 33, Part 208.11, 15 May 1976, and

WHEREAS, there is a need for a working agreement to insure a clear understanding of the flood control regulations and information exchange required for the projects operation.

NOW, THEREFORE, it is mutually understood and agreed by and between the parties hereto that the Upper Colorado Basin Projects will be operated in accordance with the following criteria:

(a) Conservation operations shall be in accordance with Bureau of Reclamation criteria as determined by the Regional Director or his designated representative.

(b) Storage space in the Upper Colorado Basin Projects shall be made available on a seasonal basis and operated for flood control in accordance with the Flood Control Diagrams currently in force.

(c) Emergency operation shall be in accordance with the procedure set forth on the Spillway Gate Operation Curves or procedures currently in force.

(d) The Regional Director is responsible for the safety of the dam and appurtenant facilities and for regulation of the Upper Colorado Basin Projects during surcharge storage utilization. Emphasis upon the safety of the dam is especially important in the event surcharge storage is utilized, which results when the total storage space reserved for flood control is exceeded. Any assistance provided by the Corps of Engineers concerning surcharge regulation is to be utilized at the discretion of the Regional Director, and does not relieve the Regional Director of the responsibility for safety of the Upper Colorado Basin Projects.

(e) Revisions of the Flood Control or Spillway Gate Operation Curves and procedures may be developed as necessary by parties of this agreement. Each such revision shall be effective on the date specified.

(f) Except as necessary in order to comply with Emergency Operation procedures, the flood control regulations shall not be construed to require dangerously rapid changes in magnitude of releases. Releases will be made in a manner consistent with requirements for protecting the dam, reservoir and appurtenances from major damages.

(g) Any water impounded in the flood control space defined by the Flood Control Diagrams shall be evacuated as rapidly as can be safely accomplished without causing downstream flows to exceed the controlling rates; i.e., releases from the reservoir shall be restricted insofar as practicable to quantities which, in conjunction with uncontrolled runoff downstream of the dams, will not cause water levels to exceed the controlling stages currently in force. Although conflicts may arise with other purposes, such as hydropower, the plan or regulation may require releases to be completely curtailed in the interest of flood control or safety of the projects.

(h) The Regional Director shall procure such current basic hydrologic data and make such current determinations of required flood control space and releases at the reservoir as are required to accomplish the flood control objectives.

(i) The Regional Director shall keep the District Engineer advised of such reservoir operating data as the District Engineer may request. The minimum data required is reservoir storage, inflow, releases and streamflow at control points designated by the Flood Control Diagrams on a daily basis.

(j) The flood control regulations are subject to temporary modification by the Corps of Engineers if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communication available. The action taken shall be confirmed in writing the same day to the office of the Regional Director and shall include justification for the action.

(k) The Regional Director may temporarily deviate from the flood control regulations in the event an immediate short-term departure is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other serious hazards. Such actions shall be immediately reported by the fastest means of communication available. Actions shall be confirmed in writing the same day to the Corps of Engineers and shall include justification for the action. Continuation of the deviation will require the express approval of the Division Engineer.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of agreement to be executed as the day and date first above written.

CORPS OF ENGINEERS

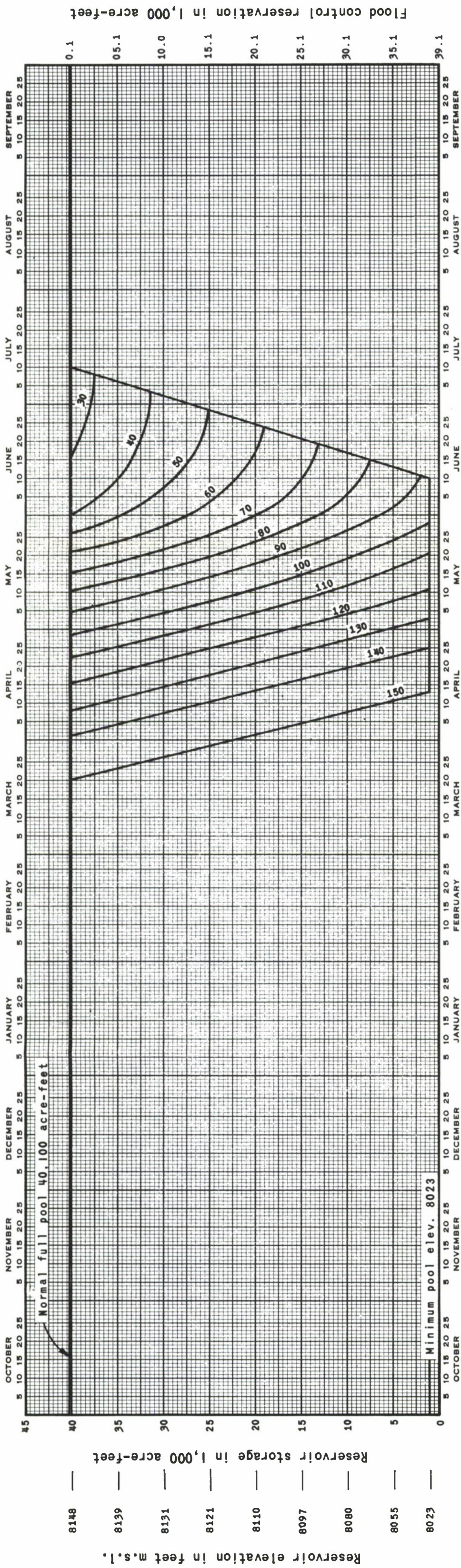
BUREAU OF RECLAMATION

By:

William E. Vandenberg
Division Engineer
South Pacific Division

By:

Donald
Regional Director
Upper Colorado Region



NOTES:

1. Parameter value is the forecasted natural inflow in thousand acre-feet into Lemon Reservoir between the given date and 1 August.
2. When available storage space is less than the required flood control space indicated on the diagram, water shall be released as rapidly as possible without causing flows in Florida River between Lemon Dam and Animas River to exceed 1,000 c.f.s. insofar as possible.
3. When water is stored above normal full pool (Elev. 8148) the outlets should be regulated such that the combined spillway and controlled release do not cause flows in the Florida River between Lemon Dam and Animas River to exceed 1,000 c.f.s. insofar as possible.
4. Releases shall not be changed more than 200 c.f.s. in any 2-hour period.

LEMON DAM AND RESERVOIR
FLORIDA RIVER, COLORADO

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations for
Lemon Dam and Reservoir in Accordance with the
Code of Federal Regulations Title 35 Part 208.11

APPROVED: *William C. Vandenberg*

Colonel, USA, Division Engineer,
South Pacific Division

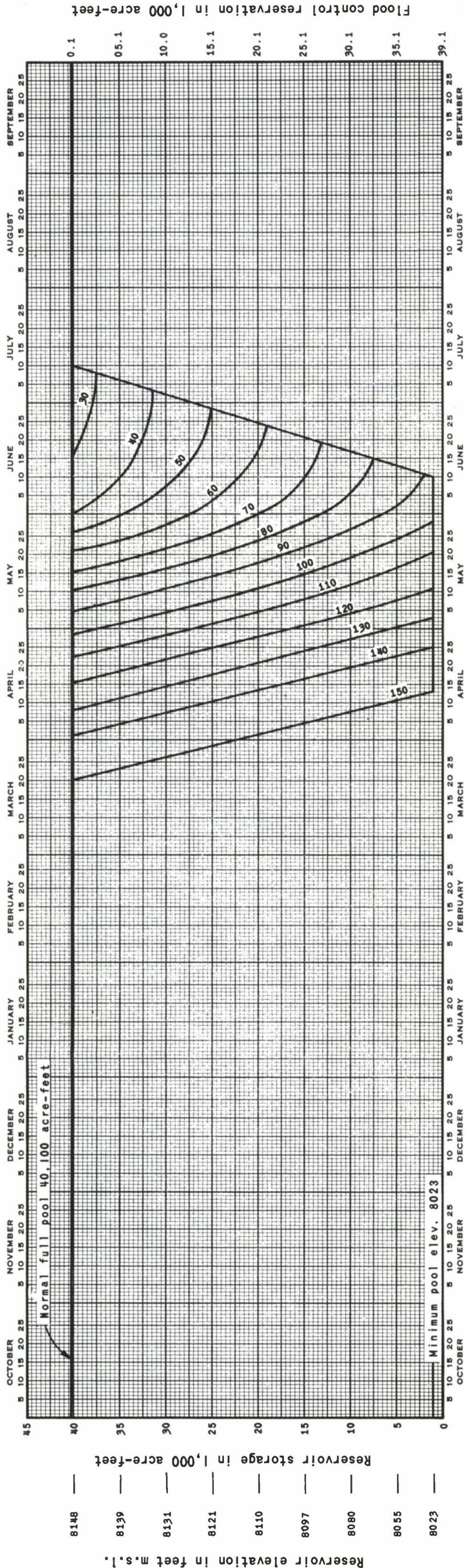
APPROVED: *Harold M. Nadeau*

Regional Director, Upper Colorado Region,
U.S.B.R.

APPROVED: *Lloyd E. Hays*

President, Board of Directors,
Florida Water Conservancy District

Effective Date: 1-27-70 File No. CO-1-13-13



NOTES:

1. Parameter value is the forecasted natural inflow in thousand acre-feet into Lemon Reservoir between the given date and 1 August.
2. When available storage space is less than the required flood control space indicated on the diagram, water shall be released as rapidly as possible without causing flows in Florida River between Lemon Dam and Animas River to exceed 1,000 c.f.s. insofar as possible.

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LEMON DAM AND RESERVOIR
FLORIDA RIVER, COLORADO

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations for
Lemon Dam and Reservoir in Accordance with the
Code of Federal Regulations Title 33 Part 208.11

APPROVED: William C. Vandenberg Colonel, USA, Division Engineer,
South Pacific Division
APPROVED: Harold M. Nadeau Regional Director, Upper Colorado Region,
U.S.B.R.
APPROVED: Joseph H. Hens President, Board of Directors,
Florida Water Conservancy District

Effective Date: 1970 File No. CO-1-13-13

TO: Defense Technical Information Center
ATTN: DTIC-O
8725 John J. Kingman Road, Suite 0944
Fort Belvoir VA 22060-6218


22 October 2008

FROM: US Army Corps of Engineers
Sacramento District Library
1325 J Street, Suite 820
Sacramento CA 95814-2292

SUBJECT: Submission of technical reports for inclusion in Technical Reports Database

The enclosed documents from USACE Sacramento District are hereby submitted for inclusion in DTIC's technical reports database. The following is a list of documents included in this shipment:

- ADB344304 • Lemon Reservoir Florida River, Colorado. Report on reservoir regulation for flood control, July 1974
- ADB344333 • Reconnaissance report Sacramento Metropolitan Area, California, February 1989
- ADB344346 • New Hogan Dam and Lake, Calaveras River, California. Water Control Manual Appendix III to Master Water Control Manual San Joaquin River Basin, California, July 1983
- ADB344307 • Special Flood Hazard Study Nephi, Utah, November 1998 (cataloged)
- ADB344344 • Special Study on the Lower American River, California, Prepared for US Bureau of Reclamation - Mid Pacific Region and California Dept. of Water Resources..., March 1987
- ADB344313 • Transcript of public meeting Caliente Creek stream group investigation, California, held by, the Kern County Water Agency in Lamont, California, 9 July 1979
- ADB344302 • Initial appraisal Sacramento River Flood control project (Glenn-Colusa), California, 10 February 1989
- ADB344485 • Report on November-December 1950 floods Sacramento-San Joaquin river basins, California and Truckee, Carson, and Walker rivers, California and Nevada, March 1951
- ADB344268 • Reexamination Little Dell Lake, Utah, February 1984
- ADB344197 • Special report fish and wildlife plan Sacramento River bank protection project, California, first phase, July 1979
- ADB344264 • Programmatic environmental impact statement/environmental impact report Sacramento River flood control system evaluation, phases II-V, May 1992
- ADB344201 • Hydrology office report Kern river, California, January 1979
- ADB344198 • Kern River - California aqueduct intertie, Kern county, California, environmental statement, February 1974
- ADB344213 • Sacramento river Chico Landing to Red Bluff, California, bank protection project, final environmental statement, January 1975
- ADB344265 • Cottonwood Creek, California, Information brochure on selected project plan, June 1982
- ADB344261 • Sacramento river flood control project Colusa Trough Drainage Canal, California, office report, March 1993
- ADB344343 • Detailed project report on Kern River-California aqueduct intertie, Kern County, California, February 1974

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- ADB344267 • Sacramento River Flood Control Project, California, Right Bank Yolo Bypass and Left Bank Cache Slough near Junction Yolo Bypass and Cache Slough, Levee construction, General Design, Supplement No. 1 to Design Memorandum #13, May 1986
 - ADB344246 • Redbank and Fancher Creeks, California, General Design Memorandum #1, February 1986
 - ADB344260 • Cache Creek Basin, California, Feasibility report and environmental statement for water resources development Lake and Yolo counties, California, February 1979
 - ADB344199 • Sacramento River Deep Water Ship channel, California, Feasibility report and environmental impact statement for navigation and related purposes, July 1980
 - ADB344263 • Sacramento River flood control project, California, Mid-Valley area, phase III, Design Memorandum, Vol. I or II, June 1986
 - ADB344262 • Marysville Lake, Yuba River, California, General Design Memorandum Phase I, Plan Formulation, Preliminary Report, Appendixes A-N, Design Memorandum #3, March 1977

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The Sacramento District source code is **410637**. Please return any materials that aren't appropriate for the technical reports database.

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Thank you,

Frances J. Sweeney
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